MYRMECIA

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MYRMECIA

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Cover. The cover for this year's *Myrmecia* features an illustration of the Water Scorpion, *Laccotrephes tristis*, by Nadia Waters. Nadia's drawing was awarded second prize in the Student Section of the 2009 AES Illustration Competition.

TREASURER'S REPORT

I would like to start by thanking the Gordon Hooper and his wife Shirley for their efforts in keeping the society's books in good order since the core executive moved to Canberra in 2008. Gordon brought us into the modern age by moving our books onto the computer program MYOB, which means that it is much easier and quicker to manage the books.

The Society is in sound financial condition. The audited accounts are attached to this report. On the Balance Sheet, you will see that the Society's total equity is $260,726, about $200,000 of which is invested in term deposits.

Turning to the Income and Expenditure statement, you will see that the Society's major income is from membership subscriptions, royalties from Wiley Blackwell and interest income. Our major expense is publication of the journal by Wiley Blackwell. The overall profit for 2009/10 was $9,319.

By now, almost everyone should have received their invoice for 2010/11 subscriptions. The initiative this year was to provide members with a number of easier ways to pay their fees. While we still accept cheques, members can now pay by credit card on-line or by phone, by BPay, or Australia Post Billpay. These services are being provided by MYOB. Although we pay fees for this service, I expect it to be on par or less than we paid in previous years for support to the Treasurer.

Additional advantages to the arrangement are that the money is collected by MYOB and deposited to our bank account on a daily basis, the Treasurer gets a daily summary of deposits and both deposits and the bank statements can be reconciled electronically. This means that the position of Treasurer will not be as onerous as it was previously and that the Treasurer will be able to know exactly the financial position at any time.

I will end with thanks to those members who have already paid their subscriptions and request that everyone else pay their subscriptions promptly. The position of Treasurer is an honorary position, and it just creates extra work and angst for the Treasurer if reminder notices are required.

Jane WRIGHT
Treasurer

AUDIT REPORT

SCOPE

We have audited the attached special purpose financial report, comprising the Balance Sheet as at 30 June 2010 and the 'Income & Expenditure of The Australian Entomological Society for the year ended 30 June 20101. The Committee is responsible for the financial reports and have determined that the accounting policies are consistent with the financial reporting requirements of the constitution and are appropriate to meet the needs of the members. We have conducted and independent audit of the financial report in order to express and opinion on it to the members of The Australian Entomological Society Inc. No opinion is expressed as to whether the accounting policies used are appropriate to the needs of the members.

The financial reports has been prepared for distribution to members fir the purpose of fulfilling the Committee's financial reporting requirements under the constitution. We disclaim any assumption of responsibility for any reliance on thus report or on the financial report to which it relates to any person other than the members, or fir any purpose other than that for which it was prepared.

Our audit has been conducted in accordance with Australian Auditing Standards. Our procedures included examinations, on a rest basis, of evidence supporting the amounts and other disclosures in the financial report. These procedures have bee undertaken to form an opinion whether, in all material respects, the financial report is presented fairly in accordance with the cash basis of accounting whereby revenue is recorded when it is received, expenses are recorded when they are paid, and no assets or liabilities, other than cash and bank balances, are recorded. Accounting Standards and other professional reporting requirements are not applicable to the cash basis of accounting adopted by The Australian Entomological Society Inc.

The audit opinion expressed in this report has been formed on the above basis.

Qualification

As is common tor organisations of this type, it is not practicable tor The Australian Entomological Society Inc. to maintain an effective system of internal control over donations, subscriptions and other fund raising activities until their initial entry in the accounting records.

Qualified Audit Opinion

In our opinion, except for the effects of such adjustments, if any, as might have been

determined to be necessary had the limitation discussed in the' qualification

paragraph not existed:

(a) The financial statements of the Australian Entomological Society Inc are properly drawn up,

(i) So as to give a true and fair view of the assets and liabilities of the association as at 30 June 2010;

(ii) So as to give a true and fair view of the result of the association for the period ending 3ll June 2010; and

(iii) In accordance with proper accounting standards and other mandatory professional reporting requirements,

(b) We have obtained all the information and explanations which to till' best of

our knowledge and belief were necessary for the purpose of the audit;

(c) Proper accounting records and other records have been kept by the Association.

(signed)
Tony Curtis
Chartered Accountant
Anthony Curtis & Co

Assets	
Current Assets	
Cheque Account Acct# 1002 3500	$64,668.61
Term Deposit Acct# 50149718	$98,648.21
Term Deposit Acct# 50146402	$99,114.57
Cash on Hand	$100.00
Trade Debtors	-$236.15
Undeposited Funds	$0.00
Inventory	$2,415.00
Total Current Assets	$264,710.24
Non-Current Assets	
Total Assets	$264,710.24
Liabilities	
Current Liabilities	
Trade Creditors	$1 ,700.00
Total Current Liabilities	$1 ,700.00
GST Accounts	
GST Collected	$5,019.30
GST Adjustment	-$1,748.28
GST Paid	-$987.13
Non-Current Liabilities	$0.00
Total Liabilities	$3,983.89
Net Assets	$260,726.35
Equity	
Reserves	$89,262.00
Retained Earnings	$162,145.28
Surplus for Year	$9,319.07
Total Equity	$260,726.35

MEMBERSHIP SECRETARY REPORT

Commencing in December 2008, I took over as Membership Secretary to lighten the workload of the treasurer.

The table below gives the membership trends over the last four years:

Category	**At 30/06/07***	**At 30/06/08***	At
Honorary	**5**	**4**	6
Full members	**366**	**360**	37
Retired members	89	86	75
Joint membership	15	13	11
Student members	34	30	36
Affiliated Societies	3	3	3
Sustaining Associates	1	1	1
TOTAL	513	497	50
Myrmecia subscriptions	19	17	19

Category	At 30/06/09	At 30/06/10
Honorary	6	6
Full members	377	369
Retired members	75	72
Joint membership	11	10
Student members	36	38
Affiliated Societies	3	3
Sustaining Associates	1	1
TOTAL	509	499
Myrmecia subscriptions	19	18

*Source: 2008 Report to AGM

Membership numbers are comparatively stable, modest declines in limited membership classes (joint and retired members) are being offset by growth in student numbers. Full memberships are growing; the apparent decline 09 to 10 is due to the 09 report being made prior to removal of financially delinquent members. The strong sign up of members from WA by Jon Majer and co. reflects the supreme importance of local representatives in sustaining the society's member bas. Let it be an inspiration to all!

Stephen CAMERON
Membership Secretary

Update on new members

Close to the AGM and conference date, several groups successfully recruited a healthy number of new members. All were accepted prior to the Perth meeting. Then at the Perth meeting our new Treasurer, Jane Wright, was equally successful in recruiting new members —did she press-gang them? Never mind — their nominations will be considered by the Core Executive at the October meeting together with those of several further nominations received via the newly instituted electronic system.

Jane put her forensic skills to the test to check on non-paying members and others whose addresses have changed. She reported that most recent resignations from the AES or lapsed members have been retired or overseas entomologists. The number of new student members is very encouraging.

The following have joined the Society since our last report in Myrmecia.

New Full Members: Lazaro Roque-Abelo, Gang Ma, Peter Gregg, Lori Lach, Mary Finlay-Doney, Lisa Berndt, Nihara Gunawardene, Oonagh Byrne, Md Touhidur Rahman, Raylea Parr, Raphael Didham and Laura Fagan.

New Student Members: Wei-Feng Hung, Morgan Lythe, James McCarthy, Andrew Barnes, Ms Wara Asfiya, Ms Elizabeth Williams.

There are just too many to give information on their entomological interests here. We met and/or heard talks by some of them at the Perth conference. We welcome them all, and hope they will contribute to the Society and also enjoy the benefits of membership.

Update on new Office Holders

The following nominations were tabled and endorsed at the Meeting of the Outgoing Council of 26 September, 2010.

President: Ary Hoffmann, takes over from Myron Zalucki

Treasurer: Jane Wright, takes over from Gordon Hooper

Regional Councillor for WA: Mazé Majer, takes over from Modika Perera

Regional Councillor for NT: Mary Finlay-Doney, Chris Palmer.

Regional Councillor for Qld: Mark Schütze, takes over from Tony Clarke

And Mark Ero has accepted the role of Papua New Guinea representative, taking over from Lastus Kuniata.

A big thank you to all the previous office holders.

Alice WELLS

Honorary Secretary

AUSTRALIAN JOURNAL of ENTOMOLOGY

CHIEF EDITOR'S REPORT

Once again, the AGM coincides with overseas travel that I have particular reasons for doing at this time of the year. I submit my apology and thank others familiar with the editorial matters for presenting my report and fielding questions.

Aims, scope and ongoing development of the Australian Journal of Entomology

The *Australian Journal of Entomology* is the premier vehicle for the publication of entomological research in the Australian region. It can only maintain this position if it continues to receive quality manuscripts and it minimizes the time between submission of a manuscript and publication of the paper. The Editorial Team, in conjunction with our publishers, Wiley-Blackwell, works hard to improve the stature of the Journal, maintain high standards of peer review and endeavours to minimise turn-around times. Members can participate in this process by submitting their high-level papers to the Journal and promptly handling papers that may be sent to them for review.

The Journal's Impact Factor this year is 0.853, representing some slippage from the previous year but still above trend for the four prior years. The journal is ranked 40/72 in the entomology category of the SCI.

Full-text Journal articles were downloaded 39,116 times in 2009. While this was a 44% decline on the 2008 numbers, it simply reflects some stabilisation after the extraordinary surge associated with digitisation of all back issues.

In contrast, downloads of abstracts was 122,239 in 2009, up 27% on the number in 2008.

The move to online submission of manuscripts through ScholarOne Manuscripts (formerly known as Manuscript Central) and abbreviated to S1M has now completed the transition phase from the previous manual system and is working well. We continue to tune the system to our requirements and add enhancements as they become available. The most recent addition is the iThenticate CrossCheck plagiarism detection module.

Production statistics for the *Australian Journal of Entomology* since the last AGM:

Production

Production statistics for the *Australian Journal of Entomology* since the last AGM:

During the period July-June since 2006-07, the flow of manuscripts was:

Volume	Part	Published	Pages	Papers
48	4	November 2009	86	12
49	1	February 2010	91	10
49	2	May 2010	96	13
49	3	August 2010	102	9

Bear in mind the rolling nature of these figures and the change in the tracking system with the advent of S1M during 2008-09. Notably, the

	2006-07	2007-08	2008-09	2009-10
Received	103	124	100	95
Accepted	41	40	32	34
Still in review	22	23	21	55
Rejected/ withdrawn/ lapsed after review	8	11	10	10
Rejected at submission	30	50	37	25
Total rejected	38	61	47	34

'Still in review' category includes submissions from the previous year and may now be more precisely tracked. Like-for-like trends will be more clearly expressed in future years with longer-term use of S1M.

The apparent decline in manuscripts rejected on my desk at submission may be an unexpected advantage of the implementation of S1M and it is no bad thing. I suspect that the greater degree of effort required to submit online helps prevent the 'shotgunning' of such submissions, notably from less-developed countries, by simple email attachment that was previously quite evident in many instances.

The other issue that is constantly of the greatest concern to me is to ensure that I balance the publication rate of papers with the incoming flow of accepted manuscripts, while trying to ensure timeliness. Each issue of the journal is scheduled for a particular date which must be met and each issue has a minimum page extent set by printing requirements. There is no leeway.

I would feel more comfortable with more manuscripts as sometimes I have concerns about reaching the target for the next issue. It is not a good feeling when that happens. The minimum page extent allowed by the printer is 64 pages and we are usually quite well above that. However, a 64 page issue would feel physically thin and I have no desire to approach the minimum. My self-imposed minimum page extent is around 75 pages and I aim for at least 12 papers per issue.

The rate of submission varies greatly month-on-month, making for further challenge in gauging how many accepted manuscripts to send for publication.

Submissions July 2009-June 2010 (excluding invited 'Overview' papers):

With a three-month production cycle, a run of three successive months of fewer than about

July	9
August	8
September	9
October	2
November	5
December	5
January	12
February	7
March	8
April	9
May	7
June	10

five submissions can cause me considerable concern.

Performance and promotion

The availability of Wiley-Blackwell's journals electronically, links to the Google search engine and the online availability of all back issues of the Journal have dramatically increased the online utilisation of the Journal

Wiley-Blackwell continues to target the Journal at exhibitions at relevant major conferences and meetings, direct marketing through promotional material, especially in Europe, North America and East Asia, and through advertising in other Wiley-Blackwell journals. The publisher reports comprehensively on all scientific, circulation and marketing metrics and initiatives for the Journal at the annual Editors' meeting which is held around July. I also encourage members to visit the Journal's website at http://www.blackwellpublishing.com/AEN for information on the Journal.

Editorial team

Tom Chapman, Tim Heard, Grant Herron, Andrew Loch and Ken Walker continue to contribute great service to the Society as Technical Editors, as does Roger Kitching as Commissioning Editor for 'Overview'. Thank you to all the Technical Editors for their hard work.

Regrettably, Tom Chapman recently advised me that he has some health matters that are causing him concern and he has asked to be relieved of his duties until January 2011. I trust that the matter will be satisfactorily resolved and Tom will be back on deck next year. In the meantime, I have asked the other Technical editors to pick up the extra load, for which I thank them.

There have been some changes in the production team at Wiley-Blackwell. Rose Williams continues as Melbourne-based Journal Publishing Manager while the Production Editor position, filled by Chin Ang Ng, is now based in Singapore rather than Melbourne. The production system runs as smoothly as before; in fact there can be occasional advantages for me with Perth and Singapore being in the same time zone. Martha Rundell, at the Melbourne office, is the S1M expert and offers us prompt and comprehensive help and advice when some of the intricacies of the extraordinarily powerful S1M baffle us. The professionalism, enthusiasm and dedication of the Wiley-Blackwell team members make them a pleasure to work with.

On behalf of the Technical Editors I also thank the Editorial Board and the many referees who have given expert opinion on manuscripts. These contributions are vital to satisfying both readers and authors and enhancing the status of the Australian Journal of Entomology.

John MATTHIESSEN
Chief Editor

MYRMECIA

MYRMECIA EDITOR'S REPORT

I have been editing Myrmecia since mid-June 2008 and I wish I could say that the job gets easier. Geoff Monteith managed to do the job for a full ten years, a record which I have no desire to emulate. Similarly Murray Fletcher held the post for a number of years.

I have been experimenting with new software which seems to have ironed out the problems I previously had with migrating photos and floating text captions. But enough about my problems. In the future, more book reviews will be incorporated into Myrmecia rather than the Australian Journal of Entomology. The journal still accepts some reviews but as one of the editorial team put it 'they are far and few between'. Books available for review are listed in the Myrmecia Editor's section, which is usually located near the front of an issue. Distribution of a book is based on how quickly a member responds, coupled with a pertinent background to review the book. You normally get to keep the copy you review in exchange for a few hundred words.

Myrmecia exists as a communication tool for AES members, so if you change your email or mailing address, please let the AES secretary know. Every edition I send out electronically I received messages stating that the recipient does not exist, and lost mail never seems to make its way back to me.

Finally, I would also like to take this opportunity to thank members during the past twelve months for their contributions to Myrmecia, and encourage them to continue to submit their contributions. If possible please, please, include photographs. In turn I will continue to endeavour to include all your information.

Sonya BROUGHTON

CONSERVATION COMMITTEE'S REPORT 2010

Projects with a significant biodiversity/ conservation component include:

Nick Murphy, Michelle Guzik and Andy Austin (University of Adelaide), Mark Adams, Steve Cooper and Rachael King (SA Museum): ARC Linkage and Discovery Program: Investigating the diversity, evolution and conservation of invertebrates in Mound Springs in SA. The Mound Springs, natural discharge sites of the Great Artesian Basin, are increasingly being threatened by demands for artesian water for pastoralism, mining and generation of power. They contain many endemic plant and animal species, yet despite being listed as a 'threatened ecological community' by the Federal government in 1999, they remain at direct risk of extinction. The project is examining the evolution and diversity of invertebrates in Mound Springs, to identify regions for conservation, and to assess possible consequences of Mound Spring extinctions.

Steve Cooper, Rachael King, Remko Leijs and Chris Watts (SA Museum), Bill Humphreys (WA Museum), Andy Austin and Michelle Guzik (University of Adelaide): ARC Linkage and Discovery Program: Investigating the diversity and evolution of subterranean invertebrate fauna (stygo-fauna) in calcrete aquifers in the Yilgarn region of central WA. The fauna comprises species radiations exhibiting high genetic diversity and endemicity in diverse assemblages of invertebrates such water beetles and crustaceans (e.g., isopods and amphipods). The project is examining the evolution and diversity of invertebrates in calcrete aquifers to facilitate their sustainable management.

Gary Taylor, John Jennings and Andy Austin (University of Adelaide) with Matt Purcell and Nancy Schellhorn (CSIRO Entomology, Brisbane): ARC Linkage Program: Investigating the systematics and co-speciation of insect herbivores on Casuarinaceae (she-oaks), to document invertebrate biodiversity and host associations, and for conservation, regeneration and land management.

Two new species of psyllid, A. veski and A. keithi (Taylor & Moir 2010 (Hemiptera: Psyllidae) were nominated by Melinda Moir (University of Melbourne) for listing as Threatened under the Environment Protection and Biodiversity Conservation Act 1999. They occur in single localities on threatened hosts, Acacia veronica, Stirling Ra., WA and Pultenaea glabra, Blue Mtns, NSW, respectively. Both species are considered at risk of extinction as they are recorded from single localities, on vulnerable or threatened hosts with restricted distributions.

South Australia does not have any invertebrate species listed as Rare, Vulnerable or Endangered under the South Australia National Parks and Wildlife Act 1972 (Version: 1.6.2010) (see http://www.environment.sa.gov.au/biodiversity/threatened-species/threatened.html).

Gary TAYLOR

Conservation Committee

EDUCATION COMMITTEE'S REPORT 2010

Through 2010 the main activity of the education committee has been oversight and support of the initiative, Entomology Curriculum Australia. The ECA is a cross-institutional collaboration of entomology educators whose aim is to establish a suite of entomology courses to provide opportunity for students to study tertiary-level entomology. The project team and advisory committee is made up of members of the Australian Entomological Society. The AES and participating universities have provided finan-

cial support for the project with major funding coming from the Australian Learning & Teaching Council.

The development of teaching resources was the main focus through 2008-2009. This year sees the first implementation of the full suite of subjects. In semester 1, 2010 the subject Insect Physiology was offered from University of Queensland (coordinator D Merritt), Invertebrate Pest Management was offered from Charles Sturt University (coordinator Geoff Gurr) and Insect-Plant Interactions was offered from University of New England (coordinator Nigel Andrew). The subject Insect Identification will be offered from University of Queensland in summer semester 2010. The subjects will be refined and marketing will continue through 2011.

The website, entomology.edu.au, has proven to be an effective portal for distributing information about entomology subjects as well as more generally by linking to news stories and featured researchers. The "ask an entomologist" link has been heavily used. Rebecca Morley, the project manager, has developed a network of AES members to whom she distributes distributed these questions.

The project funding from ALTC draws to a close in November 2010. The challenge facing the members of the ECA and this committee is how to ensure continuity of the collaboration. One solution is to support future applications for funds to support the cross-institutional team structure and further develop entomology education in Australia. Some areas for consideration are internationalisation of the curriculum by offering subjects into the Asia-Pacific region, professional development by establishing purpose-built specialist subjects and postgraduate coursework allowing graduates to strengthen their entomological education.

David MERRITT

EDUCATION COMMITTEE

VICE PRESIDENT'S REPORT 2010

This is my second report to the Annual General Meeting of the Society as Vice President. I am very grateful to Alice Wells for her tireless and careful work as Honorary Secretary, Gordon Hooper as Honorary Treasurer, Jane Wright as Public Officer and Stephen Cameron as Honorary Memberships Secretary. In July 2010 Gordon Hooper retired as Treasurer and Jane took on those responsibilities as well. On behalf of the Society I would like to pass on our sincere thanks to Gordon and his wife Shirley for the hard work they put in to the running of the Society. In particular, Gordon was instrumental in converting the society account books into an electronic form. The new core Executive had 11 meetings since the 40th AGM in Darwin, in all months except January 2009.

It has been a very busy year for the Society, and the Executive, and I only have space here to touch on some important highlights. I think that your Executive team has started to achieve a number of the goals that it set for itself in 2008. Thanks to all those who have recruited new members to the Society over the past 12 months; our membership has stabilised close to 500. Jonathan Majer deserves special mention here for recruiting the largest number of members to the Society since the last AGM. His achievement acts as a beacon for us all! As always, our focus as an Executive team has been to deliver more benefits to our membership, both new and old, and the remainder of my report will focus on these important reasons to be a member of the Australian Entomological Society.

We were very pleased to learn that Don Sands won the 2010 Australian Natural History Medallion, a prestigious award made by the Field Naturalist's Club of Victoria. Congratulations to Don — this award recognises his tireless work on insect conservation over many dec-

ades. The Society initiated and supported Don's nomination, and the Executive is very pleased to see the efforts of one of our members recognised in this way. Thanks in particular are due to Alice Wells for spearheading Don's nomination, and to those who supported our nomination. The Society is also supporting Don's trip to Melbourne to receive the award.

Murray Upton, Beth Mantle (Collection Manager of the Australian National Insect Collection) and Anne Hastings (CSIRO Ecosystem Sciences) have been working very hard over the past 6 months to produce a 5th edition of the very popular Society publication, Methods for Collecting, Preserving and Studying Insects and other Terrestrial Arthropods. The new edition has been completely updated and rewritten and will be available for display and purchase at the 41st AGM and conference in Perth. Jane Wright will be offering a special Conference discount price, so get in quickly to avoid disappointment.

The Journal

Our Chief Editor John Matthiessen, our team of Technical Editors, our Overview Editor Roger Kitching, and the staff at Wiley-Blackwell have continued their excellent work on the journal over the past 12 months.

The Executive negotiated with Wiley-Blackwell to provide a page charge discount for members publishing in the Journal during 2009. We have decided to extend that discount and completely waive page charges for members of the Society who are first author on manuscripts accepted by the Journal. Initially, this will be a 12 month trial, beginning with manuscripts accepted after December 31, 2010. Although this change represents a significant loss in revenue for the Society, Jane's financial modelling suggests that the Society can afford it. We anticipate that this important change will encourage many more of you to submit manuscripts to the journal, increase the average impact of papers published in the journal, and increase our membership.

Wiley-Blackwell are pleased to offer the 'Early View' publishing service for Australian Journal of Entomology at no charge to the Society. This service allows papers to be published individually online ahead of allocation to a journal issue.

The Journal website is located at www.blackwellpublishing.com. Articles that are fully prepared more than 2 weeks prior to the due date for receipt of manuscripts for an issue are eligible to be published using this service. Taxonomic papers will be exempted from the Early View service until the International Code of Zoological Nomenclature is updated to recognise online publication. Until that time the Production Editor of AJE, Chin Ang Ng, will work closely with John Matthiessen to ensure taxonomic papers are not published online ahead of their publication in print.

We have also accepted an offer from Wiley-Blackwell to provide our members with a 25% discount on books published by Wiley-Blackwell. Because W-B are one of the major entomological and ecological publishers globally, this is a truly significant benefit to members. Please watch the Society website for further details.

Thanks to Rose Williams from Wiley-Blackwell's for looking after the Society in these significant ways.

Myrmecia

Our newsletter editor, Sonya Broughton has continued to do a very fine job, bringing out another volume of interesting issues, on time. Thanks to Sonya and the Regional Councillors for keeping us up to date on the entomological activities around the country.

Our Society Website

During the past 12 months the Society launched the new Society website http://www.austentsoc.org.au. The site is maintained on a new server provided by the Taxonomic Research and Information Network (TRIN, www.taxonomy.org.au). Feedback on the new site so far has been very positive, and our goal is to make the site much more active and informative. In particular the Announcements and Notices pages are updated weekly, so send me your position advertisements, conference flyers, etc for uploading onto the website. Also, new members are now able to joint the Society through the website.

Mark Schutze has been the main driving force in establishing the Society Facebook page (at

Aust Ent Soc). The page now has 61 members, and is a great vehicle for organising things like conference accommodation, travel, fieldwork, and reaching the community for common solutions.

Subscriptions

Jane Wright has worked hard over the past few months with the staff at MYOB to provide a variety of subscription payment methods, as follows:

1. over the web
2. by BPAY
3. by phone
4. by mail
5. in person at an Australia Post outlet.

Look at the bottom of your subscription notices for further information on these options. We hope that this change will make it easier for members to pay their subscriptions, and pay them on-time.

Conferences

The Executive and the Organising Committee for our 2010 meeting has enlisted the help of Kylie Anderson to act as a postgraduate coordinator for this Conference. In order to increase student membership, we have agreed to offer a 15% discount (down to $50.00) to students who take out Society membership at the Conference. Kylie has also very efficiently and effectively organised a postgraduate dinner on the Monday night of the conference. This dinner is supported by the Society. We would like to see this event repeated at future Conferences, and extended to include a workshop on issues of relevance to the Society student membership. We owe Kylie a very special thank you for taking on this role so enthusiastically.

The society has had successful joint conferences with the New Zealand Entomological Society, in Canterbury in 1996 and in Adelaide in 2006. The next joint conference will be 28 August–1 September 2011, at Lincoln University on the South Island of New Zealand. Set aside resources in your travel budget to join us for an exciting cross-Tasman entomological experience next year. For more information check the website of the New Zealand Entomological Society (http://www.ento.org.nz/meetings.htm).

Lastly, we hope you enjoy the 41st AGM and Conference here in Perth. On behalf of all Society members, thanks to the local organising committee, especially Jonathan Majer, Maze (Maria) Majer, Modika Perera and Sonya Broughton for organising such a full and exciting scientific and social program.

David YEATES

Vice President

OUTGOING PRESIDENT'S REPORT

Myron Zalucki

Will Monarchs go extinct? Some reflections on University life with apologies to "The Republic"

The classicists amongst you will note the somewhat platonic title, but then it is the Presidents' address. On reflecting for this discourse I found that I have spent 66% of my life at a University, having completed my Honours degree in 1976 at ANU, undertaken a PhD at Griffith and moved over the river to UQ in 1981. If we add the time spent at Primary and Secondary School I have spent 91% of my life in institutional care. That should be sufficient information to work out how old I am.

What would my address have been if I had been President of the Australian Entomological Society at some time past and I had been at UQ?

Here is a brief (and approximate) history through time of that address line: Department of Biology (1911-1948), Sub-department of Entomology (1948-1952), Department of Entomology (1952-1999), Department of Zoology & Entomology (1999-2000), Department of Botany, Zoology & Entomology (2001), School of Life Sciences (2001 -2003), School of Integrative Biology (2004-2007), School of Biological Sciences, (2008-?).

So what happened around the late 1990's? Essentially the failure of the University sector and triumph of the much blamed Harvard School model of business and marketing. We now speak of 'Training', essentially to supply employer driven needs instead of an education (basically remedial 3R's, which is a consequence of the failure of the primary and secondary school systems). Funding is of course demand driven, 'bums on seats'. Taken to its logical conclusion if all students wanted to be journalists then such schools of higher learning would be well endowed and of course smaller "non-productive" units would be closed. We do not need entomology, plant pathology, plant science and so forth. The training quality, like politics, is by opinion poll…CEVALS, EVALS and the like. But I rant again. I have written at

Last chance to see? A tree trunk in Sierra Chincua, Mexico, covered with overwintering monarchs. Photo: F. Rivadavia

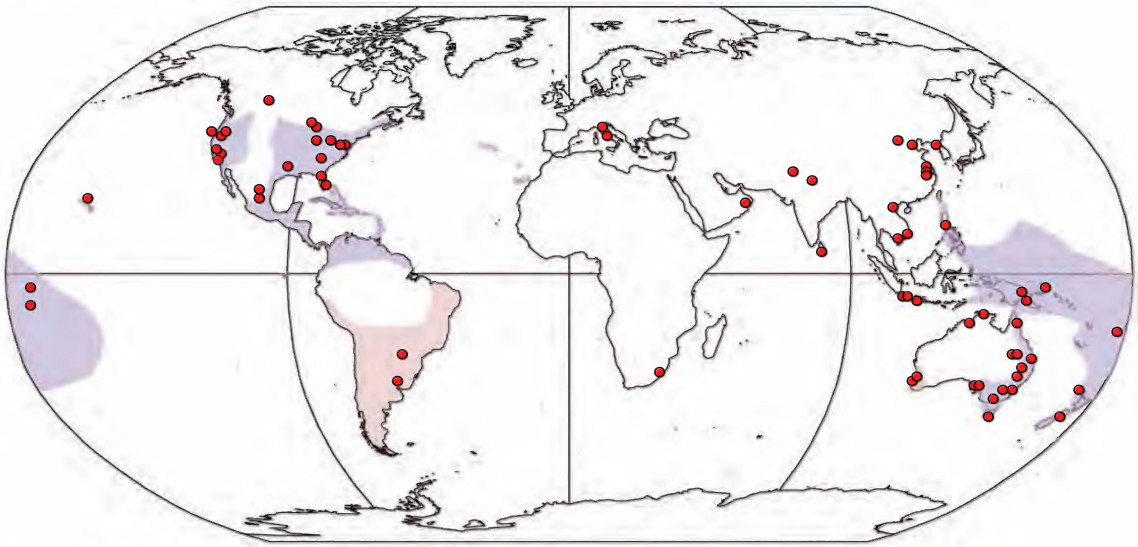


Figure 1. A wanderer in a milkweed patch. Places I have visited over the years for major conferences or to work on insects, mainly monarchs, Helicoverpa and diamondback moth. The distribution ofmonarchs and a closely related sub-species in South America also shown.

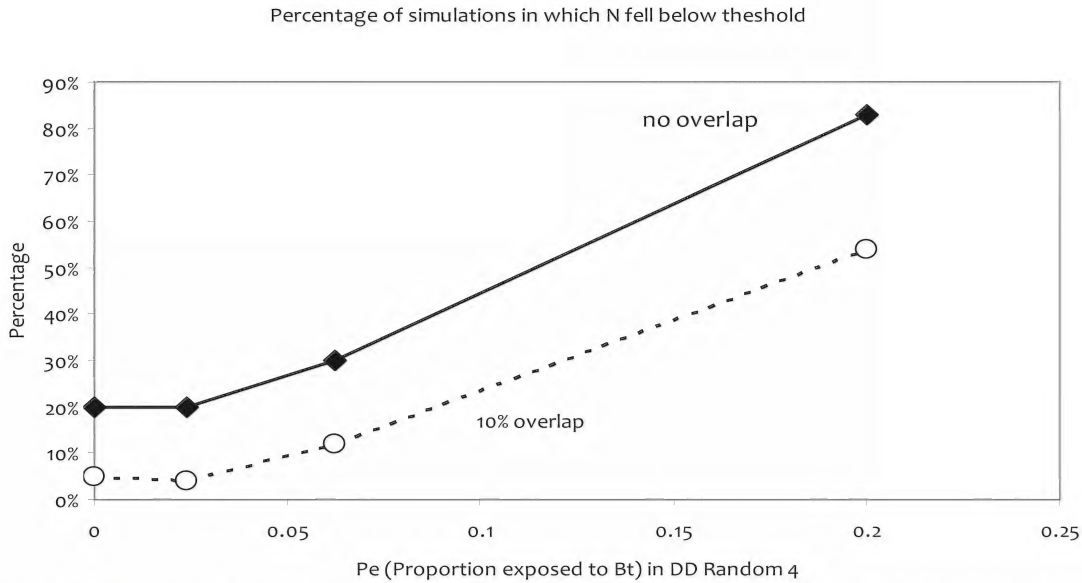


Figure 2. Percentage of simulations of monarch populations at over-wintering sites that drop below 1 million for one density dependent model as a function of the probability of exposure in generation 3 to

length about these matters in previous issues of Myrmecia.

So what are Universities? A community of scholars devoted to finding out new things, discourse, debate, and educating young minds? Or are they just money making ventures? Of course there is no reason why they cannot do both but it does require management to concentrate on and enable the core business, research and education that is provided by its key resource – its staff. The academic staff component is oft accused of being elitist and living in ivory towers. If that means questioning what we know, discovery of new things and telling folk they are wrong, and importantly why they are wrong, then that is fine by me. We are meant to be elite and proud of it, this is quite different to being arrogant of course!

Besides, being an academic is (has been, continues to be) fun (in spite of the best attempts by management to make it otherwise)! For this wanderer in a milkweed patch I have had the privilege working with colleagues around the globe (Fig 1). I have never felt the tension between applied and basic entomology. There is nothing fundamentally different about pest insects other than that they damage something we are interested in. When I was doing my PhD thesis the first oil crisis occurred. With the price of oil skyrocketing it was becoming feasible to grow milkweed in north Queensland, crush it twice a year, extract the latex and distil a light crude. Monarch butterflies would have been pests. I have subsequently continued to research the basic biology and ecology of monarchs, heliothines and diamondback moth, amongst others. This has meant travelling to exotic places and working with like-minded people.

Here I want to pose a provocative question: Will monarch butterflies go extinct? This question is usually posed when some organism is knocking on the door of extinction, at which point we salve our collective conscience with some well-intentioned wheel spinning. By posing the question early we can assess the threatening process and perhaps avert the problem? Besides, the question and assessment is an intellectual challenge.

The well-known monarch butterfly over-

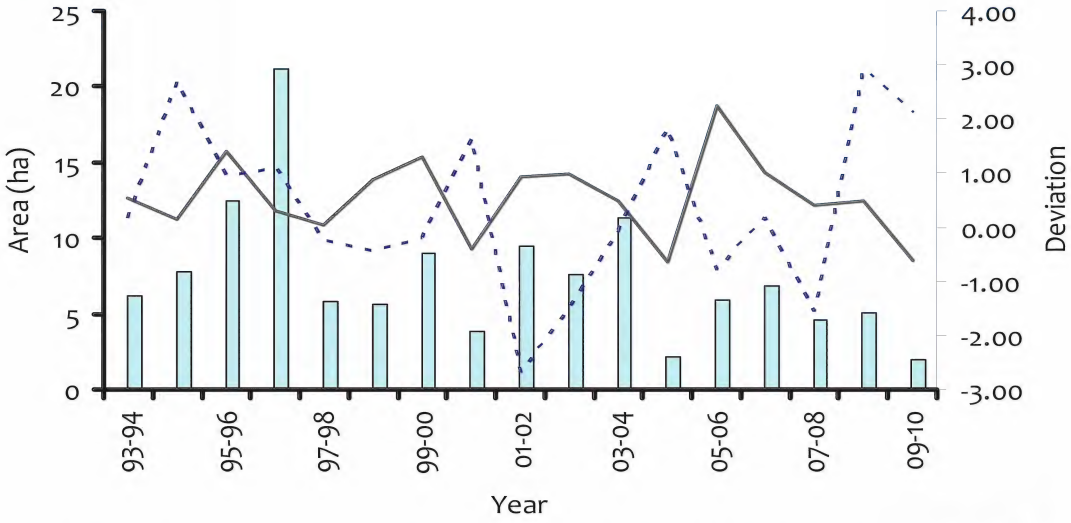


Figure 3. Area of over-wintering recorded in Mexico in ha (bars) (data from Monarch Watch). Also shown is the deviation of summer temperatures from the norm and rainfall (second axis *10) for the Great Lakes Region. (Data from www.climate.weatheroffice.gc.ca) Low populations seem to be associated with cooler, wetter than normal summers in recent times.

wintering phenomenon is already listed as endangered. We can rephrase the question as: will Bt corn, herbicides, climate change, and logging of over-wintering sites impact on monarchs and drive the phenomenon extinct?

I will briefly consider some threatening processes: exposure to Bt corn pollen and effects of herbicides on host plants. I will have to be, in effect, a Queensland Monarch in Monsanto's Court and question the meaning of risk. All entomologists will be familiar with the Bt-corn monarch butterfly controversy. I will not go over old ground here but I do want to highlight shortfalls. The researcher response was to objectively assess the risk posed by Bt corn pollen to monarchs, a not inconsequential task since Risk = Pe*Pt, where Pe is the probability of exposure and Pt is the toxic effect. Exposure is given by Pe =l*o*a, where l is the proportion of monarchs that are reared from corn fields, o is the overlap of pollen shed and susceptible stages of monarchs and a is proportion of area with Bt corn.

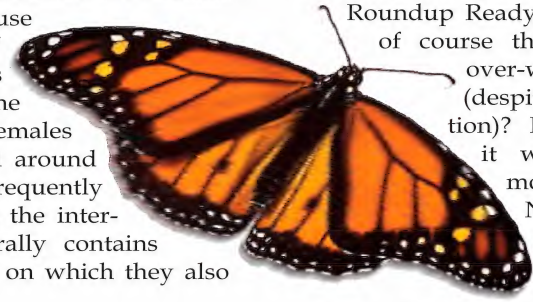
Entomologists are good at assessing toxic effects – years of experience with insecticides. The assays on monarchs were essentially based on leaf disk of milkweed covered with known doses of pollen. Of course milkweeds are aptly named – damaged plants exude a milky latex. Leaf disks do not have a latex response and we have shown latex and its included cardenolides adversely affect neonate monarch survival on some milkweeds (Zalucki et al. 2001). Experiments on milkweed disks will underestimate mortality and miss any interaction effects. Nevertheless calculated risk values, 0.047 to 2.6%, are very low. So does this mean the risk is low?

Actually it means very little. Do the thought experiment. For pest insects, e.g. Helicoverpa sp. in Australia, we spray highly toxic chemicals on a regular basis (Pt is high) over nearly all crop hosts at least once (Pe is high as well). So I would imagine the risk by the above EPA model is high. Have we ever driven such a pest insect to extinction with chemical control? I am not aware of any. The reason is simple, risk needs to be seen in the context of the species population ecology. Thus to assess the risk of Bt-corn pollen we need to undertake a population viability analysis of migratory monarch

butterflies exposed to genetically modified maize.

We use published risk measures (see Dively et al. 2004, Environmental Entomology 33: 1116-1125) in a spatially discrete model of 4 linked generations, G where: Gi = (Gi-1Ri + jiGi-2Ri) SeSlSp, and j = proportion overlap between generations and varies from 0 to 0.1, R = average realized fecundity, and S = survival of eggs, larvae & pupae. It is generation 3 that is exposed to pollen from Bt corn. We have undertaken simulations using some 7 different model structures in terms of how specific parameters and functions are described and estimated with and without density dependence. This actually makes little difference to the relationship between the % of over-wintering populations that go "extinct" and the Pe, the probability of exposure to pollen (Fig 2). I will leave it to the EPA to decide this is a low risk.

The distribution and abundance of host plant patches will have a dramatic effect on monarch abundance. This is because milkweeds are the species' primary resource. Patches are pick-up joints for the sexes (Zalucki 1993) and females lay eggs on plants in and around patches. Females move frequently between patches, crossing the intervening matrix that generally contains milkweeds at low density on which they also oviposit.



What happens when the matrix is made empty? This is essentially what has happened in the monarchs North American summer range as Roundup Ready ® soybean is widely planted and low density milkweed populations decimated. So what? Patches remain on roadways and the odd old field. Difficult to assess of course, but using some simple simulation models, we have suggested females may not be able to lay some 20% of their eggs on average (Zalucki & Lammers 2010). This is likely a greater impact than mildly toxic corn pollen.

So there are two threatening processes but what determines large scale fluctuation in monarch abundance? As every Australian entomologist knows, and with apologies to Andrewartha and Birch, "it's the weather stupid"! Variation in the timing of rainfall, temperature fluctuations, temperature extremes and so forth will affect milkweed abundance and distribution. Consequently monarch reproduction and survival will be affected, significantly affecting seasonal and year-to-year variations in abundance and distribution (see Zalucki & Rochester 2004).

If we look at year-to-year variation in the size of the over-wintering population in Mexico we notice both fluctuations and an apparent decline (Fig 3). If monarchs were some large furry mammal, the alarm bells would be sounding and no doubt some relevant government department would commissioning an enquiry and the writing of recovery plans. But note the apparent effect of temperature and moisture in the Great Lakes region (Fig 3). This is not a definitive analysis but suggests there is a strong climate/weather signal in monarch fluctuations which perhaps indicates a decline.

How now to separate the effects of Bt-pollen, Roundup Ready ® soybean, climate and of course the continued logging of over-wintering sites in Mexico (despite the so called protection)? I am biased of course but it will need a well-posed model for the species in North America to sort this out. I am sure there are some excellent ivory tower academics that could rise to the challenge.

So will monarchs go extinct? As a species, the answer is no. The monarch is present as a roadside weed, so to speak, throughout the Pacific and Australia. It also occurs in Central America with a sub-species in South America (Fig 1). As for over-wintering sites in Mexico, I would suggest you take the opportunity to see this phenomenon as soon as possible. It is truly one of the few things for which I would use the descriptor "awesome" (students please take note).

In closing I need to acknowledge all the folk that have contributed to my understanding of monarchs and their ecology. Specifically and in no particular order: Roger Kitching, Lincoln Brower, Mike Bull, Tony Clarke, Hugh Dingle, Jane Hughes, Hsuan Lammers, Duncan Mackay, Steve Malcolm, Tim Paine, Wayne Roches-

ter, Yoshito Suzuki, Karen Oberhauser and many, many others. Above all I need to thank Jacinta and four great kids for allowing me to pursue my passion.

Finally it has been a privilege to be President of the society. I leave the society in good hands. I have kept you too long…

Some shameless self promotion:

Zalucki MP. 1993. Sex around the milkweed patch – the significance of patches of host plants in monarch reproduction. In: SB Malcolm & MP Zalucki (eds.) The Biology and Conservation of the Monarch Butterfly. Los Angeles Museum of Natural History Contributions to Science, Los Angeles.

Zalucki MP & WA Rochester. 2004. Spatial and Temporal Population dynamics of Monarchs Down-Under: Lessons for North America. In: K Oberhauser & M Solensky (eds.) The Monarch Butterfly: Biology and Conservation. Cornell Univ. Press: Ithaca, New York.

Zalucki MP & JH Lammers. 2010. Dispersal and egg shortfall in Monarch butterflies: what happens when the matrix is cleaned up? Ecological Entomology 35: 84-91.

Zalucki MP, Malcolm SB, Paine TD, Hanlon CC, Brower LP & AR Clarke. 2001. It's the first bites that count: survival of first-instar monarchs on milkweeds. Austral Ecology 26: 547-555.

Myron ZALUCKI

NEW PRESIDENT

Ary Hoffman: Looking for amazing entomology stories

In my dealings with undergraduate students, the public and even many environmental managers, I am often frustrated by the lack of understanding and appreciation of insects and other small invertebrates. "Bugs" very much remain the enemy to be removed and controlled in our society's pursuit of orderliness and cleanliness. In fact, ALL the email and media enquiries I've had about insects in the last 5 years have been of the pest variety. Beyond having a passing appreciation for the role of bees in pollination and silk worms in fibre production, the "Australian people" seems to continue to regard insects in a very negative light. With the exception of butterflies, they remain an unrecognized component of animal biodiversity despite comprising the bulk of it. This issue is typified by the current and negative focus on locust plagues in south-eastern Australia and *Aedes dengue* mosquito vectors in India affecting Commonwealth Games athletes.

Several years ago, I presented on beneficial and harmful insects in vineyards at a CRC forum and challenged the industry to include drawings or photos of beneficial insects in their vineyards on their wine labels to replace the bird and mammal images used by some operations. I pointed out that these other animals were unlikely to be providing any benefits to their vineyard operations, unlike the parasitoids, predatory mites, spiders, Collembola and native ants contributing freely to pest control and soil nutrition. I'm still waiting for the first images to appear, but of course vineyard operations are only responding to public perceptions in selling their wine.

Overseas, several insect-related phenomena have captured the public's imagination. One that comes to mind immediate is the mass migrations of the monarch butterfly from the US into Mexico. In his recent presidential address at the excellent Perth meeting of our society last month, Myron Zalucki highlighted that monarch migrations are now regarded in the US as a threatened ecological process which has captured the public's attention. In many other

countries, the profile of insects has also improved. For instance in the UK, dragonflies have become important tools for the public to help monitor the effects of climate change, and public awareness of the diversity of ladybirds has blossomed after invading *Harmonia axyridis* ladybeetles from Asia became a threatening process.

Many fascinating Australian insect stories deserve to be widely known in the public arena and should be capturing the attention of lay person and student alike. I think of Bogong moths that travel huge distances to aestivate in summer in the alpine regions, providing food for highly endangered mountain pygmy possums and helping them to build up fat reserves to survive the winter. These possums may well be threatened now as a consequence of reduced moth numbers although, as is typical in Australia, the data are scanty. Bogong moths have represented a native food source for human populations in the past, and they can also act as a pest species. Yet we know so little about their biology and population dynamics.

There are other spectacular examples of local insects playing an important role in our life and our environment as well as being fascinating in their own right. A few that immediately come to mind are the green ants of tropical Australia that are such a predominant feature of the environment and provide pest control, the air conditioned homes of our termite species that represent sustainable ways of maintaining a cool environment, the seed dispersal activities of our many ants that are an essential part of our biodiversity, the primitive social activity of our native bees that live in earth banks, and the dung beetles that clean up and fertilize our soils. Our insects are amazing in ways that the public rarely appreciate. While people can readily appreciate sightings of colourful Ulysses and Cairns Birdwing butterflies in tropical Queensland, colourful Limacodidae caterpillars are normally regarded as a threat!

I'd like to challenge members of the society to come up with their own unique examples of fascinating insects, mites or spiders that might capture the public's imagination. I'd like to combine the best 12-20 of these into a volume under the Society banner. Our target would be a set of scholarly and well referenced chapters with examples presented in such a way that the information can excite the public about entomology and acarology. We can combine the weird and wonderful with examples of insects that have a major ecological and environmental impact. I suspect that this is an excellent way of promoting entomology more generally to the public.

To start this process, I'm keen to receive ideas from all members, preferably a paragraph or so in length. Tell us why you think the example warrants inclusion as an amazing entomological story, and whether you have visuals to accompany your story. We'll approach publishers to develop this idea, run the examples past a small group and come up with a final list! Please send me your ideas at ary@unimelb.edu.au.

Ary HOFFMAN
AES PRESIDENT

CONFERENCE REPORT 2010

The Australian Entomological Society's 41st AGM and Scientific Conference was held from the 26-30th September at The Vines Resort in the Swan Valley, WA. The conference consisted of 5 sessional themes which reflected the diversity of entomological studies from the 'pure' to the applied. Topics included diagnostics and infomatics, systematics and taxonomy, insect biology and ecology, threats to biodiversity and their amelioration, biosecurity, food security, and biodiversity conservation management. The National Invertebrate Pest Initiative (NIPI) also held a symposium on 'Integrated pest management and grain production systems'. There were also special meetings of the NIPI group and the Open Entomology Course Initiative.

In total there were 162 full delegates, 14 day registrations and three half-day registrations. Delegates from all states and territories attended, with the exception of Tasmania. International attendees included delegates from New Zealand, Botswana, Brazil, the USA, Saudi Arabia, and South Korea. A delegate from Nigeria

was unfortunately unable to attend, due to problems with obtaining a visa in time for the conference.

The conference was opened by Lyn Beazley, the Chief Scientist of Western Australia, who spoke about the diverse flora and fauna of WA. There were three keynote and three plenary speakers. Keynote speaker Joseph Allotey from Botswana, spoke about Challenges Imposed by Climate Change and Future Outlook. Lazaro Roque-Albelo spoke about "Dangerous travellers", Introduction and Dispersion of insect species by tourism boats in the Galapagos Islands, Ecuador. Ary Hoffman, who is also the new president of the AES society, spoke about IPM in southern grain systems and why they are different. Plenary speaker Shashi Sharma addressed the audience about Biosecurity in WA. Raphael Didham spoke about 'Invertebrate diversity and conservation: global threats, local challenges', whilst Mark Harvey talked about 'Systematic research in the 21st century - what can be delivered and how?'.

The usual illustration, photographic and student presentation and poster sessions were also held during the conference.

There were 24 posters, with the best poster presentation going to Andrew Heaver for 'Burns, beetles and bark: impacts of a new fire regime on bark invertebrates'. Andrew's poster stood out from the other posters in that much of it was hand crafted.

Illustration Competition. Thirteen works were submitted to the illustration competition, with all but one entry from students at the University of Newcastle. The judging panel included Terry Houston (WA Museum) and natural history artists Robert Fleming and Martin Thompson.

Student Section. First prize in the black and white section was awarded to Monique Carson for her Common Brown Butterfly. Second prize was awarded to Jan Clark for her illustration of a weevil. Jan also won the colour illustration (student competition) for her illustration of *Anoplognathus porosus*.

Open Section. The open section black and white illustration were both awarded to Jan Clark for her illustrations of a cowboy beetle (B & W) and wedge beetle (Colour). Jan was the only entrant in this section.

Photographic Competition. Nine entries were received for the photographic competition, which were judged by Pia Scanlon and Marc Widmer from DAFWA. Dina Yu Rogatnykh from Russia won first and third prize for her photos of caterpillars (Tentrinidae, Monema flavescens). Second prize went to Piotr Trebicki for his photo of ants in water. The photo was taken during the recent Victorian floods. Unfortunately it is not known whether the ants survived .

David and Fleur Knowles of 'Spineless Wonders' put on an enchanting display of live and preserved insects. The stick insects in particular, had to be prised from the acquisitive hands of more than one entomologist.

Social events included a welcome reception by the pool hosted by DAFWA, and the conference dinner at Sandalford winery. The dinner was held in a candle-lit room with candelabra decorated with butterflies and moths. There was also an optional half-day tour of wineries and other attractions in the area.

The conference was sponsored by Department of Agriculture and Food WA, ABRS, CRC for Plant Biosecurity, Ecologia Environment, Curtin University, Murdoch University, Chevron, CSIRO Publishing, Taylor and Francis Group and Cambridge Press. AusAID sponsored the visit of Joseph Allotey.

Finally, I thank Sally Brown without whom the conference would have been that much harder to organise. On behalf of the organising committee, Modika Perera, Maze (Maria) Majer, Jonathan Majer and myself, we hope that those of you that attended enjoyed the conference. Modika, Maze and I are also grateful to Jonathan for showing us the ropes.

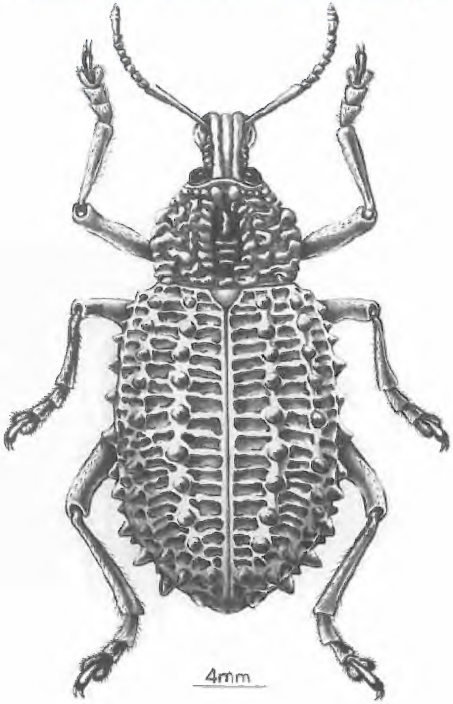
Next year, the conference moves offshore to Christchurch, NZ. Notice of the conference appears in the events section of this newsletter.

Sonya BROUGHTON

First Place. Tentrinidae. Dina Yu Rogatnykh, Russia.

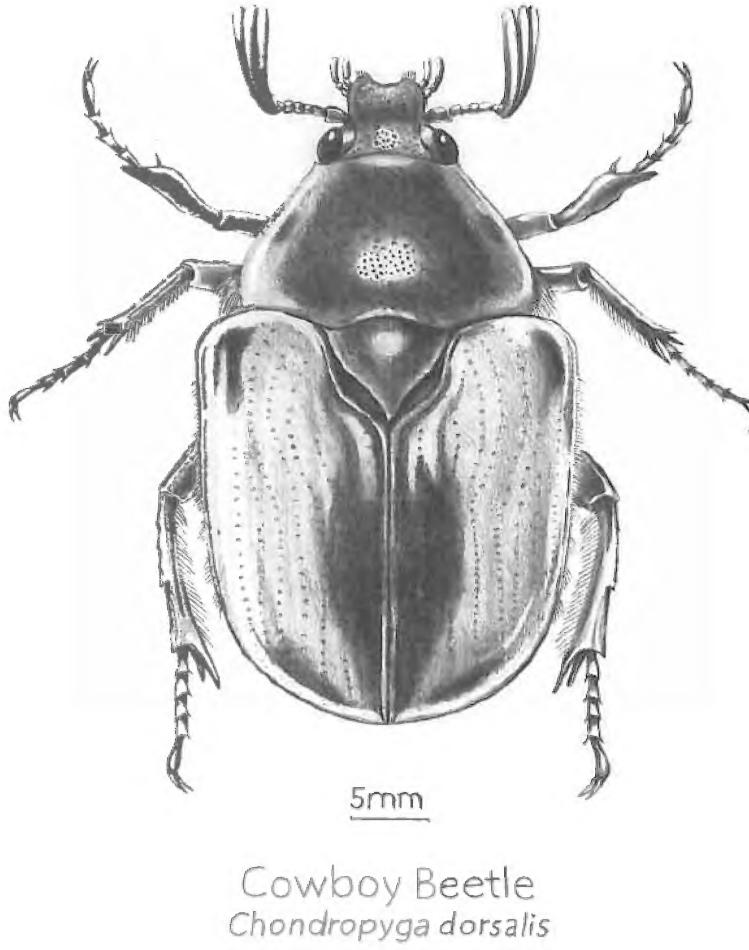
Second Place. Ants on water. Piotr Trebecki, Victoria

First place in the black and white section (Student). Monique Carson, University of Newcastle, Common Brown Butterfly.



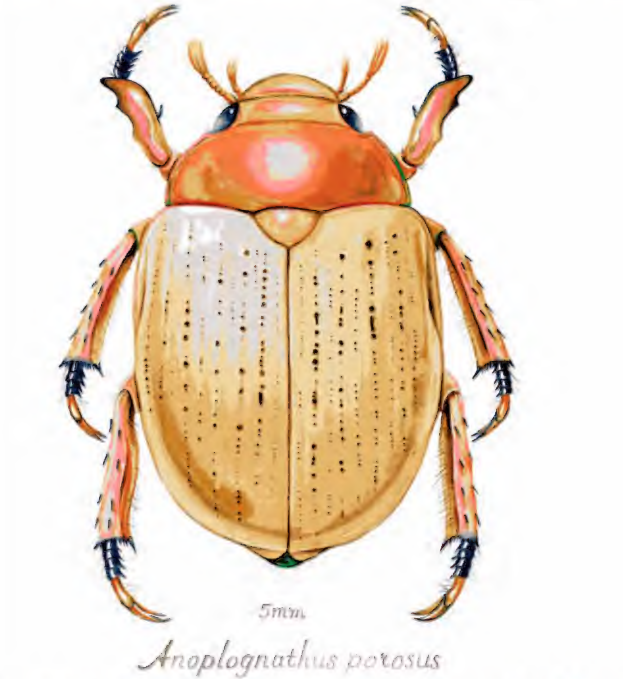
Weevil

Second prize in the black and white section (Student). Jan Clark, University of Newcastle, Weevil.



First place in the black and white section (Open). Jan Clark, Cowboy Beetle

First place Colour Illustration (Student) Jan Clark, . University of Newcastle.



First place Colour Illustration (Open) Jan Clark,. University of Newcastle.

Delegates at the 41st AES Scientific Conference and AGM. Photo: S. Eyres

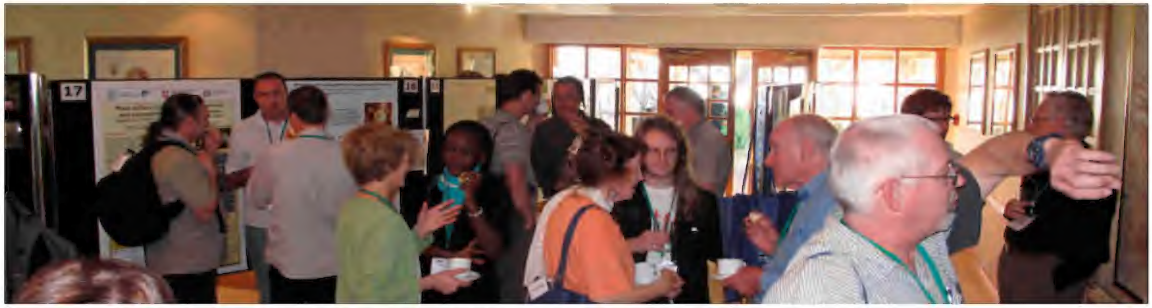
Members of CHAEC at their meeting prior to the conference. Photo: M. Fletcher.

Shashi Sharma addresses the audience at the welcome reception. Photo: M. Perera

Stick insect, part of the live display at the conference by David and Fleur Knowles (Spineless Wonders). Photo: S. Broughton

Sonya Broughton, Maze (Maria) Majer, Lyn Beazley (WA Chief Scientist) and Modika Perera.

The attentive audience as Myron Zalucki gives his presidential address Photo: M. Fletcher



Morning tea amongst the posters. Photo: M. Fletcher

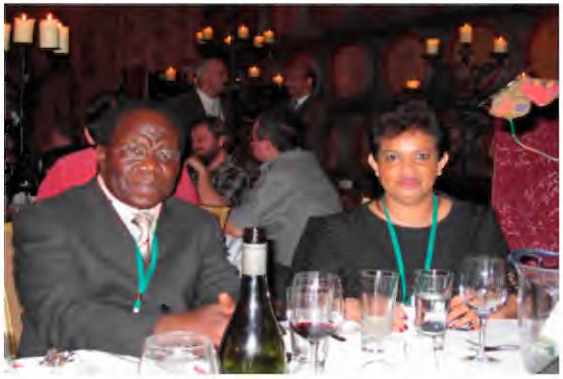
Mark Harvey (WA Museum) launches the new edition of 'Methods for collecting, preserving and studying insects and other terrestrial arthropods.' Photo: M. Fletcher

Beth Mantle with a copy of the new edition of 'Methods for collecting, preserving and studying insects and other terrestrial arthropods.' M.S. Upton and B.L. Mantle

Conference Dinner at Sandolford Winery. Photo: F. Queiroz Sant'Anna

Maze (Maria) Majer, Jonathan Majer, Janet Farr and Dalva Queiroz. Photo: F. Queiroz Sant'Anna

Nadine Guthrie and Murray Fletcher. Photo: F. Queiroz Sant'Anna



Joseph Allotey and Modika Perera. Photo: F. Queiroz Sant'Anna

Maze (Maze) Majer, James Ridsdill-Smith and Sonya Broughton. Photo: F. Queiroz Sant'Anna

Aziz Ajlan , Geoffrey Bedford, Margaret Clift, Alan Clift and Sarah Mansfield. Photo: F. Queiroz Sant'Anna

Adrian Rakimov, Matt Davis, Piotr Trebecki, Felix Bianci. Photo: F. Queiroz Sant'Anna

Myron Zalucki, Gary Fitt, Peter Gregg, Owain Edwards and Alice Del Socorro . Photo: F. Queiroz Sant'Anna

Dalva Queiroz, John Jennings, Geoff Gurr and Raphael Didham. Photo: F. Queiroz Sant'Anna

IAN MACKERRAS MEDAL WINNER 2010

The Ian Mackerras Medal is the Australian Entomological Society's highest award and is given every two years to a member of the society under 50 years of age who has demonstrated excellence in entomology. This year the award was made to Professor Scott O'Neill. The citation by the judging panel is given below.

Scott O'Neill

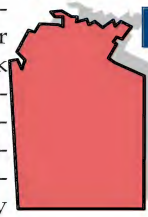
Scott O'Neill is a medical entomologist who completed his BSc (Hons 1) at the University of Sydney in 1984, PhD at the University of Queensland in 1989, and then held research positions overseas from 1991 to 2001, mainly at Yale University. In 2001 Scott returned to Australia as Professor and Head of the then School of Integrative Biology at the University of Queensland (now School of Biological Sciences). Over his research career Scott has been highly productive with 100 high impact research papers and some 3500 ISI citations. His area of work has been mainly in developing an understanding of the interactions between insects and their bacterial symbionts, and in particular Wolbachia. Wolbachia are very widespread in different insects, and while it is relatively easy to detect their presence it is much harder to understand what they are doing. Scott O'Neill has become a global leader in elucidating the many ways in which Wolbachia influence the basic biology of their host insect. Based on this broad understanding he is now leading an innovative program to utilise unique features of Wolbachia interactions in mosquitoes to control the major mosquito borne disease dengue fever. His work is highly regarded and supported through agencies such as the Bill and Melinda Gates Foundation and he currently manages personal research grants of over $14 million. O'Neill's contributions to science have been recognised by Fellowships in the American Association for the Advancement of Science and the Australian Academy of Science. Despite his Head of School responsibilities Scott has maintained a significant research team and provides active leadership of high quality science in Wolbachia biology, the molecular mechanisms by which they function, Wolbachia genomics and transformation, and in applying this knowledge to human disease control. As an active, high profile scientist we believe Scott O'Neill is a worthy candidate for the Ian Mackerras medal.

Postscript: Scott has recently accepted the position of Dean of Science at Monash University. We wish him well.

See 'Entomology in the news' section this edition for information on Scott's current research.

Scott O'Neill receives the Mackerras Medal from Myron Zalucki at the AES conference. Photo: G. Maynard

ENTOMOLOGY AROUND AUSTRALIA



NORTHERN TERRITORY

CSIRO Ecosystem Sciences – Tropical Ecosystems Research Centre

French student **Quentin Auriac** arrived in July and will undertake a six month internship in Alan Andersen's ant biodiversity lab. Quentin is from the ENSAT University in Toulouse and is assisting PhD student **Maïa Berman**, from Charles Darwin and

Montpellier Universities, looking at the effects of fire on New Caledonian ant biodiversity.

During June and August, **Magen Pettit**, **Jodie** Hayward and French student **Erika Manard** from ENITA in Bordeaux sampled for ground dwelling and arboreal ants on Groote Eylandt, as part of a BHP Billiton GEMCO Site-wide Flora and Fauna Survey. The use of invertebrate sampling will assess the significance of species occurring on Groote Eylandt and will provide useful information on the success of rehabilitated minesites.

In September, Magen and Jodie conducted invertebrate biodiversity sampling on Melville Island, as part of the Tiwi Islands Carbon Project. This long term project is investigating the biophysical and economical potential of fire management for Greenhouse gas abatement in tropical savannas on Aboriginal lands. Magen and Jodie also spent a day sharing their invertebrate pitfall trapping fieldwork with Tiwi College senior boys, as part of their Tiwi Rangers cadet program, and were also joined by Tiwi Land Rangers. Also this month, the ant biodiversity lab had two Year 10 work experience students from Kormilda College. **Calum Henderson** and **Ruben Andersen** each spent one week learning about invertebrate sampling, sorting, preservation techniques and using ant identification keys.

Over the last few months, CSIRO staff **Barbara McKaige**, **Kelly Scheepers**, **Alan Andersen** and **Jodie Hayward** and have been providing hands-on teaching of environmental assessment and monitoring with the 'Literacy through Science' partnership with CSIRO and Tiwi College. The ant lab was pleased to recently host Year 12 Tiwi College students Louella Tipungwuti and Kumunjayi Ullungura. The senior girls were given a tour around the CSIRO laboratories and the Science Education building and were treated to an excursion to the Territory Wildlife Park.

CSIRO hosted a group of AFAC/Bushfire CRC conference delegates in September. The group was given a briefing by **Alan Andersen** and **Gus Wanganeen** on the invertebrate biodiversity work, which is part of a long-term fire experiment at the Territory Wildlife Park. On a sad note, CSIRO staff will farewell Gus Wanganeen next month, when he retires after more than 30 years of service. Gus joined the previously known CSIRO Division of Forest Research in1976 as a field assistant, examining planting practices and trace element trials on Carribean pine on the Tiwi Islands and the Kimberley, WA. He joined the Division of Wildlife Research (now Ecosystem Sciences) in 1981 to assist with small mammal research. For the past 15 years he has been providing technical assistance with invertebrates, first with spiders and more recently with termites, working with Tracy Dawes looking at their functional role in soils.

Chris PALMER
NT Regional Councillor

AUSTRALIAN CAPITAL TERRITORY

Australian National Insect Collection (ANIC)

By this time everyone should know that CSIRO Entomology has merged with CSIRO Sustainable Ecosystems to form a new Division called CSIRO Ecosystem Sciences. Scientists and management staff are now going through the interesting process of setting up new administrative structures, while the daily life of ANIC goes on as usual.

ANIC staff attended two public events in August. The Atlas of Living Australia was officially launched by Senator the Hon. Kim Carr, at the Melbourne Museum. CSIRO Chief Executive Megan Clark welcomed several new organisations to the project, and announced the addition of some new very large databases to the ALA information network. Also in August, staff took part in a field day to show off recent work under the umbrella of the Taxonomic Research and Information Network, at the National Botanic Gardens in Canberra.

Beth Mantle recently played a part in the Perth Mint's production of a set of Australian coins, which are being marketed under the heading Backyard Bugs. The nine $1 coins feature Australian invertebrates – a grasshopper, blowfly, dragonfly, ladybird, birdwing butter-

A busy week in ANIC. Left, celebrating Marianne Horak's retirement, 31st of July: Marianne, Beth Mantle, Jane Wright, Cate Lemann, Joanne Daly. Photo: Bruce Halliday.

fly, cicada, bull ant, praying mantis, and red back spider. The Mint contacted Beth when they were looking for an entomologist to check the facts in the booklet that comes with the coins. She helped out with suggestions, including the scientific names of the animals and images for the artwork. The booklet includes a short profile of Beth and information about her role as manager of ANIC.

Two members of ANIC reached important personal milestones recently. In August, **Tom van Gerwen** celebrated his amazing achievement of 50 years of service in CSIRO. Tom first joined CSIRO in 1954, and spent several years as a junior technician with Dick Norris and Lindsay Barton-Browne working on sheep blowfly. After two years away he returned to the organisation in 1961 as a full-time technician with Lindsay, and later with Bill Vogt, working on physiology, behaviour, and reproduction of sheep blowfly. His work involved extensive trapping of flies in the field, using a bait made from a revolting mixture of rotting liver and sodium sulphide. Tom also worked on the physiology of the Australian plague locust, and then on pests of stored grain, until his retirement in 1996. Since 1998 Tom has been managing the ANIC volunteer program, which has now reached the remarkable total of 65,000 hours of voluntary curatorial support work in the collection. Well done Tom, and thank you from all of us. Lepidopterist **Marianne Horak** retired in July, after more than 25 years with CSIRO. Friends and colleagues celebrated the occasion with a series of parties and dinners, and with a magnificent feast of cakes and delicacies at morning tea on July 31st. Marianne is currently having a well-earned holiday in Europe with her family, and is planning to return to ANIC in November to continue work on Microlepidoptera as an Honorary Fellow.

Tom van Gerwen on his 50th anniversary with CSIRO, 3rd of August. Photo: Bruce Halliday.

The Lepidoptera laboratory has been a busy place in other ways. In July, **Bobbie Hitchcock** went to London to look at *Epiphyas* specimens in the new Darwin Centre at the Natural History Museum. The collection there contains the types of more than 20 *Epiphyas* species, and other specimens significant for the revision of the genus, including the only known specimens of *Epiphyas iodes* and *E. lycodes*. The information obtained during the visit will assist her to build a species identification key for the genus. In August Bobbie attended the Invasive Species Symposium at the European Congress of Entomology in Budapest, and presented the results of her *Epiphyas* revision. **Marianne Horak** also attended the ECE and gave a presentation on her taxonomic research on the Australian scribbly gum moths in the genus Ogmograptis (Bucculatricidae), and their unique insect/plant interactions. **Peter Marriott** and **Marilyn** Hewish visited separately in July preparing for the next volumes of Moths of Victoria, and in August Michael Braby spent a few days working on the Lepidoptera collection and the associated literature for his current projects on butterflies. In September You Ning Su and Ted Edwards picked up the **Ken Fairey** collection of moths from Revesby in Sydney. With help from Len Willan, they spent a day loading cabinets and sorting through some of the masses of data accumulated by Ken. The collection is extremely rich in Anthelidae, in which Ken took a great interest, and in Pterolocera in particular, which Ken revised in his unpublished Master's thesis. LaTrobe University PhD student **Vedia** Yazgin also visited to look at morphometric variation in the common brown butterfly *Heteronympha merope*, and whether the wing morphology of this species has changed over time.

Work on revising and expanding the Australian Faunal Directory is now well under way. The ANIC project team includes **Robyn Meier**, **You Ning Su**, **Eva Slipinska**, **Debbie Jennings**, **Kim Pullen**, and **Bruce Halliday**, with support from **Ted Edwards**, **Tom Weir**, **Beth Mantle**, and **Rolf Oberprieler**. They report good progress on developing and revising databases of Lepidoptera, Coleoptera, nematodes, and mites. The results will eventually be made available through the ABRS web site.

The Coleoptera laboratory has also been a very busy place recently, thanks to a steady stream of visitors. **Kip Will** of the University of California, Berkeley, visited to work on Carabidae as a part of his sabbatical project; Michael Nash of the University of Melbourne also came to work on Carabidae; **Roger De Keyzer** (Sydney) came to work on Cerambycidae with **Hermes Escalona** and **Adam Slipinski**; **Cezary** Rojewski (Sydney) came to identify some beetles that form the subject of some beautiful photographs that he's taking; and **David de Little** (Tasmania) visited to look at some Chrysomelidae. The beetle team farewelled **Jiahui Li**, who has finished his PhD work on Coccinellidae and moved back to China, and welcomed **Jordan Crabbe**, who is working with **Tom Weir** and **Nicole Gunter** to produce a database of dung beetles in the genus Lepanus. **Rolf Oberprieler** has been busy writing a series of chapters for the next beetle volume of Handbook of Zoology, which deals with Chrysomeloidea and Curculionoidea. Rolf has also been working on

sorting out the identity of a weevil in the genus *Gonipterus*, which is a serious pest of Eucalyptus in western Europe. The results of that work, with Portugese collaborators **Manuela Branco** and **Carlos Valente**, were presented at a recent conference of the International Union of Forestry Research Organizations in Germany.

Kerrine Harvey from Macquarie University visited to get some intense training in identification of mites and thrips, as part of her studies on the native and exotic fauna associated with daisies of the genus Senecio. PhD student **Omid Joharchi** is visiting **Bruce Halliday** for three months to work on mites of the family Laelapidae, which form commensal relationships with a variety of insects, especially Coleoptera and Hymenoptera.

Laurence Mound returned from a visit to museums in Europe with his right arm in a sling, and a shoulder that required urgent surgery. Despite this interruption, thrips work continues, with four manuscripts in press, and a range of visitors to the thrips collections. **Desley Tree** spent a week working on a LucID key to the 199 species of Thripinae known from Australia. The finished product should be available early in 2011. Jorge Torres of the University of Pernambuco visited with a very nice sample of predatory thrips from Ficus galls in northern Brazil. **Li-Xin Eow** from the National University of Malaysia, Bangi, is working here for three months on Southeast Asian Thysanoptera, particularly the polymorphic species in the subfamily Idolothripinae, which feed on fungal spores. This is part of a longer term project with her university, developing a broader understanding of the Asian thrips fauna and its relationships to the Australian fauna.

Bruce HALLIDAY

QUEENSLAND

Department of Employment, Economic Development and Innovation, Forest Health

Brenton Peters was in Fiji for a week in June investigating infestations of subterranean termites in houses. Subterranean termites in buildings in Fiji were hitherto unknown. As at June, 920 of 11,388 houses surveyed were infested, 16 of 25 schools surveyed were infested and 2253 trees were found infested by subterranean termites in Lautoka. These infestations were found in an area of at least 100 square kilometres. Termites in Lautoka and Labasa, Vanua Levu were identified as the exotic Asian subterranean termite, *Coptotermes* gestroi (Wasmann) by **Robert Eldridge** (Industry & Investment, NSW). *Coptotermes gestroi* has been in the Lautoka area for many years (decades) and is firmly established in buildings and in the 'wild'. Recommendations have been made to the Fiji government that resources should be directed, through a transitional period, to 'user pays' and to Integrated Pest Management. Eradication and containment are not feasible.

Simon Lawson, **Manon Griffiths**, **Janet McDonald**, **Judy King** and **Ross Wylie** have recently completed an AusAID-funded project to improve Forest Health Surveillance of Vietnams timber plantations. The project involved developing a pest and disease database; curating and refurbishing the existing insect collection in Hanoi; running a series of training workshops both in Brisbane and at several regional centres in Vietnam; establishing and equipping a pilot network of observation centres in regional areas; and preparing a Field Guide, posters and information sheets on the key pests and diseases of Vietnamese plantation forestry. The training workshops in Vietnam were a highlight of the project, despite the arrival of Typhoon Ketsana midway through the trip.

The Forestry Insect Collection is being prepared for the move to its new home in the Eco-Science Precinct, Boggo Road. The collection will be held in the state-of-the-art Insect Collection Hall but will be retained as a separate collection representing one of Australia's largest Forest Insect collections. Our Insect Wood Museum (representing 60 years of collecting evidence of insect damage in standing trees and timber) will not be moving. The specimens were photographed and catalogued by Murdoch De Baar and the museum has been relocated, in its entirety, to commercial interests. The collection will continue to be used for identification, education and training purposes.

Army Malaria Institute (AMI)

In the Queens Birthday Honours list in June,

Bob Cooper was made a member (AM) in the Military Division of the Order of Australia for exceptional service to the Australian Defence Force as a scientific officer specialising in Medical Entomology. He was presented with his AM by the Governor of Queensland in mid September. Bob spent 3 weeks of July on the island of Tanna, Vanuatu, surveying dry season mosquito larval habitats with the plan to integrate larval control into the malaria elimination program.

In May, **Steve Frances** spent 10 days collecting mosquitoes at High Range near Townville to identify the presence of arboviruses. In July, Steve went to Thailand and visited colleagues at the Armed Forces Research Institute for Medical Sciences, Bangkok, and in early September attended the biennial conference of the Mosquito Control Association of Australia at Caloundra.

Tanya Russell, from the Pacific Malaria Initiative, based at the School of Population Health, UQ, has been an occasional visitor to AMI to discuss the surveillance work **Bob Cooper** has conducted in Vanuatu and Solomon Islands, and to conduct bioassays of bednet material.

Queensland University of Technology

Mark Schütze has just had his FAO/IAEA placement officially extended for a further 6 months and is continuing work at their Seibersdorf labs in Austria, where he is examining the mating systems and sexual compatibility among selected pest species of the *Bactrocera dorsalis* species complex. He has also recently presented at the 8th International Symposium on Fruit Flies of Economic Importance Valencia Spain (which he attended with **Tony Clarke** and **Solomon Balagawi**) and the IXth European Congress of Entomology Budapest Hungary.

Mark Schütze

QLD REGIONAL COUNCILLOR

VICTORIA

CESAR (Centre for Environmental Stress and Adaptation Research) at University of Melbourne.

Several CESAR staff and students enjoyed the interesting and enjoyable AES conference in Perth, with the added excitement of the elevation of our director to president of the Society. Meanwhile our diverse range of research interests continues across laboratory, terrestrial and aquatic landscapes. Climatic adaptation is the general theme of our many Drosophila projects. **Ronald Lee** and **Lea Rako** use genetic and genomic tools to study the adaptive body size variation in *D. melanogaster* and *D. simulans*. They work closely with **Linda Partridge** and **Ying Chen** in the UK to unravel the molecular mechanisms of wing size variation. Honours student **Aiden Varan** uses transgenic techniques to characterise *Dca*, a strong candidate gene for size variation in *D. melanogaster*. Together with **Kazuo Takahashi** in Japan, Ronald and Lea investigate the significance of heat shock genes in developmental stability. In addition, Ronald also collaborates with **Herve Colinet** in Belgium to determine the functional roles of stress-inducible genes that enable flies to recover from chill coma. **Marina Telonis-Scott** focuses on how regulation of transcript splicing affects the ability of flies to respond to different types of stresses, such as heat and desiccation. She has recently completed a microarray experiment and identified hundreds of candidate regions in the *D. melanogaster* genome that influence desiccation resistance. Fine scale characterisation of these regions is underway. Apart from desiccation, Marina confirms an association between the activity of a gene called *ebony* and the degree of body pigmentation in flies collected along the Australian east coast. Research assistants **Jennifer Shirriffs** and **Alen Rako** provide logistic support and coordinate large scale experiments such as the yearly field sampling of flies, desiccation assays, field-release experiments, fertility and fecundity assays.

Kate Mitchell is about to complete her PhD project, which investigates the upper thermal limits of a number of Drosophila species, including the model organism *D. melanogaster* and many rainforest species. She also measured heat shock protein gene expression in flies subject to different temperature ramping regimes. Our Masters student **Madeleine Gane** conducts transgenic experiments and association screens to uncover the functional roles of the *Frost* gene in desiccation resistance. **Michele Schiffer** is embarking on establishing phenotypic distributions for several ecologically important traits using large populations. Flies at the phenotypic extremes will then be genotyped for various candidate genes and/or sequenced using the Next-Generation sequencing platforms such as the Roche/454 or the Illumina/Solexa.

Investigations into grape insect pests and their natural enemies continues: **Ian Smith** is undertaking a Masters Research project into to the impact of both local and landscape levels of vegetation on the native pest species, the light brown apple moth (Epiphyas postvittana) to determine if vegetation harbours, contributes to control or has no impact on the species' abundance. **Clare D'Alberto** is in the final stages of completing her PhD entitled 'Spiders in vineyards: spatial distribution, the influence of vegetation and potential for pest management'. She is analysing the spatial and temporal distribution of spiders within vineyards throughout the growing and harvest seasons, and exploring the influence of local and landscape factors on distribution and species richness. Additionally, she is using a PCR-based Gut Content Analysis technique to detect spider predation of the major pest, light brown apple moth.

Adrian Rakimov successfully completed his PhD, 'Aspects of the biology, ecology and biological control of soft scale insects in Australian vineyards', revealing greater diversity in both soft scales and their natural enemies than previously known.

Purabi Ghosh is continuing her PhD, investigating the role of grass in provision of natural enemies in both vineyards and broad acre crops. The role of insects across our involvement in **Caroline Wilson**'s PhD, examining their role in the diet of bats!

Paul Umina is continuing with his research and extension activities around invertebrate pests of broad acre crops. This includes the delivery of PestFacts South-Eastern, in conjunction with **Stuart McColl** (CESAR Consultants). Research efforts have been largely around mapping and gaining a better understanding of insecticide resistance in the redlegged earth mite (*Halotydeus destructor*). CESAR Consultants and the Birchip Cropping Group are undertaking an IPM research and demonstration trial at Charlton, Victoria. The trial forms part of a national GRDC funded project involving five replicate trials across southern Australia. Workshops are also being held by each of the participating groups, and are designed to complement the trials and to increase the overall understanding of IPM within the grains industry. At the recent Australian Entomological Society conference in Perth, project leader Darryl Hardie (DAFWA), presented an overview of the project and an update on the trial progress.

Sommer Jenkins and **Ange Tsitsilas** have been busy with several field trials looking at alternative chemistries for crop establishment pests and the impacts broad-spectrum insecticides have on invertebrate communities. Sommer and Ange are also examining the impacts of grass verge strips in habouring beneficial invertebrates and the biological control role this may play in adjacent cropping systems. **Matt Hill** is currently investigating the temperature profile of the redlegged earth mite. He is examining populations from a range of environmental conditions to determine how the mite may be adapted to different conditions in Australia. Matt is also working on the phylogeography of redlegged earth mite across Australia. Both of these activities will be used to enhance predictions of climate change on this species. Matt was recently awarded a Loftus Hills Memorial Scholarship to expand his PhD thesis.

John Roberts has recently submitted his PhD thesis on the population genetics and ecology of the lucerne flea, *Sminthurus viridis*. He is currently surveying Victorian populations of redlegged earth mites for signs of insecticides resistance, as well as developing genetic markers for the asexual pest mite, *Balaustium medicagoense*.
Linda Thomson

Department of Primary Industries, Victoria

All DPI Victoria entomologists have updated their skills in locust biology and ID in preparation for the imminent locust plague. DPI Vic has declared an agricultural emergency and established 3 Incident Control Centres (Irymple, Tatura, and Horsham DPI Centres) and a State Incident Control Centre at DPI Knoxfield. All four centres are staffed with a rotating 5 day shift of entomologists for the duration of the incident.
David Williams

Mali Malipatil visited China to attend the First International Workshop on Reduviidae at Beijing Agricultural University on 11th July; then the 4th International Heteropterist's Society meeting at Nankai University Tianjin 12-17 July to present a paper on *Nysius* of Australasia, and to chair one afternoon scientific session of the meeting. He also managed to visit collections in those institutions as well as at Chinese Academy of Sciences. Mali then travelled on to Washington DC (USA) to attend and chair the annual meeting of the FAO / IPPC's Technical Panel on Diagnostic Protocol, 26-30 July. While in the US he visited the National Museum of Natural History (Smithsonian Institution), Washington, as well at the American Museum of Natural History, NY to examine the lygaeoid and reduviid true bugs.

Mark Blacket recently attended the Australian Entomological Society conference and meeting held in WA, where he presented a paper on the morphological and molecular identification of the metallic-green tomato fly (*Lamprolonchaea brouniana*). While in Perth he also attended the CHAEC meeting to represent the VAIC, and visted the WAM to examine lance fly (Lonchaeidae) specimens in their collection.

Piotr Trebicki attended the Australian Entomological Society conference in Perth where he presented results on the impact of elevated carbon dioxide on aphid, *Barley yellow dwarf virus* and wheat. On 10th on October Piotr participated in the Victoria State Titles Underwater Hockey competition in Richmond Pool, Melbourne representing Horsham.

WESTERN AUSTRALIA

DAFWA, South Perth

In September the entomology group sadly farewelled Nic Monzu, Peter (Pedro) Davis, Paul Wilson, Fred Ramsden and Phil Lawrence with a BBQ at 'Blowies'. The five retired after over 30 years of service, with over 150 years of entomological expertise between them. The speeches were kicked off by Shashi Sharma, followed by **Nic Monzu**, **Peter Mangano** and **Peter Davis**.

Nic Monzu was with the department for 31 years, joining Agriculture Western Australia (as it was then called) in 1979 as the sheep blowfly Entomologist. No doubt some staff still remember their early careers in the blowfly exposure house infesting sheep with blowflies, or checking traps as part of the early warning system that Nic set up. Nic later became chief entomologist of the then Entomology Branch, where he became involved in project and staff management. Nic plans to spend more time on his boat.

Peter Davis was with the department for 33 years, starting his career in 1977 as a technician and ending up an entomologist and the resident snail and ant expert. Whilst his colleagues remember him as having a bit of a lead foot and an affection for red wine, over his career Peter and his team developed an effective bait for control of Argentine Ant, and managed to keep WA free from European wasp for over 20 years. Not an easy task. Peter's wife has already planned his retirement for him.

Paul Wilson started his career as a lab technician working on the biological control of lucerne aphids in 1978. Paul later moved onto biological control of Patterson's curse, though has also worked on the Argentine ant control program, wingless grasshopper management, European wasp eradication and dung beetle redistribution.

Sonya Broughton and **David Cousins** travelled to Carnarvon in early September to visit growers affected by plant viruses. Sonya and David were outnumbered by plant virologists and pathologists who included Monica Kehoe and Dominie Wright from DAFWA, Roger Jones from UWA/

Nic Monzu shows off his—present a sailing boat and alcohol dispenser, whilst Peter Davis tries his on (below)

Larry Dyson, Nic Monzu, Paul Wilson, Fred Ramsden and Peter Davis

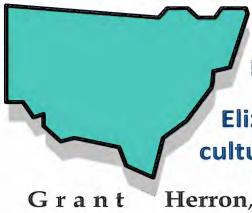
Listening to farewell speeches are from left, Marc Poole, Simone Wilson, Paul Wilson and Andras Szito (front). In the background are Nic Monzu, Robert McNeice and Larry Dyson.

David Cousins and Sonya Broughton collecting thrips from capsicum in Carnarvon. Photo M. Kehoe

DAFWA, and Denis Persley and John Thomas from DEEDI. Whilst the pathologists couldn't see the insects for the virus, Sonya and David had eyes only for the insects and mites. Aphids have been at very high levels throughout the year in both Carnarvon and Kununurra. As a whole, the group thoroughly enjoyed the trip and look forward to continuing their work with Carnarvon growers in the future.

Sonya also attended the AES conference, with fellow conference organisers **Maze Majer**, **Modika Perera** and **Jonathan Majer**. Sonya managed to lose her voice during the conference, but was rescued by **Jonathan Majer** who gave her welcome speech, and **Stewart Learmonth**, who gave her talk.

NEW SOUTH WALES



INDUSTRY & INVESTMENT NSW

Elizabeth Macarthur Agricultural Institute

Grant Herron, **Garry Levot** and **Olivia** Reynolds gave an overview of their

research followed by a tour of the entomology facilities at EMAI on the 25th August to students from the Integrated Pest Management class at the University of Sydney.

Grant with help from I&I NSW molecular biologist **Yizhou Chen** and CSIRO Research Scientist **Tom Walsh** prepared a new preliminary research proposal for the CRDC titled "Sustainable resistance management of mites, aphids and mirids in Australian cotton".

THE UNIVERSITY OF SYDNEY

Faculty of Agriculture, Food and Natural Resources

Sarah Mansfield and **Dieter Hochuli** from the University of Sydney took part in a panel discussion on 22 September for the new "Biodiversity in the Pub" series sponsored by Cosmos magazine. The topic of debate was "What have animals ever done for us?"

Alan Clift, **Sarah Mansfield** and **Mahmuda Begum** attended the Society conference in Swan Valley where they presented two talks and a poster. The conference was very enjoyable and a great opportunity to catch up with colleagues.

Sarah MANSFIELD

NSW Regional Councillor

SOUTH AUSTRALIA

The University of Adelaide

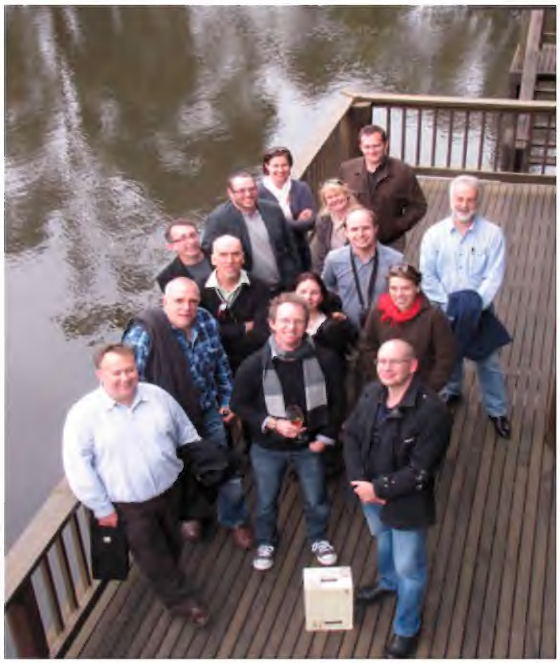
Congratulations to **Gary Taylor** and **Kerrie Davies** who were each awarded ABRS grants in the 2010/2011 round. Gary's project is a 3-year Research Grant on the "Systematics and host associations of Australian psyllids (Hemiptera: Psylloidea)" with co-investigators **John Jennings** and **Andy Austin**, and Kerrie's is a 1-year Capacity-Building grant on "New species of *Fergusobia* (Nematoda: Neotylenchidae)".

In June **Dalva Luiz de Queiroz** from Empresa Brasileira de Pesquisa Agropecuaria (EMPRAPA Florestas) visited Gary Taylor to identify psyllids. There are four species of introduced pest psyllids on eucalypt plantations in Brazil, especially from *E. camaldulensis*, *E. grandis*, *E. urophylla* and cloned hybrids of the latter two species. Dalva's project, during an extended visit to Australia hosted by **Jonathan Majer** at Curtin University of Technology, is to assess the potential for further possible incursions of Australian psyllids into Brazil.

Andy Austin spent two weeks in Europe during June, first with **Lars Krogmann** at Stuttgart Museum, working on a major revision of Australian pompilid wasps. Significant progress was made on the project but Andy, unfortunately, arrived in Germany on the day they thrashed Australia 4-1 in the World Cup, which the Stuttgart Museum entomology staff were pleased to point out over the following few days. Andy then attended the International Hymenoptera conference in Koszeg, Hungary and presented a paper with **Kate Muirhead** on the phylogeography of braconid parasitoids of sugarcane stemborers and a poster with **Kate Sparks** to the systematics of the ant genus *Monomorium* in Australia. On his way home, Andy made brief visits to Cardiff Museum and the Natural History Museum, London.

Good news for the systematics group in Adelaide, with Andy Austin, **Steve Cooper**, **Mark Stevens** (SA Museum), **Bill Humphreys** and **Mark Harvey** (WA Museum) being awarded a large ARC Linkage grant "Biodiversity and population genetics of groundwater calcrete ecosystems of central Western Australia" for 2010-2013. This project will continue the collaborative research of the group focused on stygofauna and troglofauna of the region, and includes the mining company Minara Resources Limited as a major industry partner.

John Jennings chaired the 21st AGM of the Council of Australian Entomological Collections at The Vines, Swan Valley WA. John was re-elected as chair. John presented a paper at the 41st AES Scientific Conference at the Vines, and later attended a meeting of Entomology Curriculum Australia.



Attendees of the Willunga Hill Medical Entomology Symposium, Aug 12-15, 2010

Mosquitoes and Public Health Research Group, Sansom Institute, University of South Australia

PhD student **Aishah Azil** returned from a successful field trip in Malaysia working with vector control teams there, and is now wrapping up her global review of dengue vector surveillance methods. **Natasha Wilson** continues to wrestle with the *Aedes aegypti* population modelling work for the Eliminate Dengue program (UQ). **Christie Bader** is into the home stretch of her studies of *Ae. aegypti* reproduction.

Samantha Williams recently completed the 2009-10 northwest Adelaide mosquito surveillance program. Saltmarsh mosquitoes were in abundance; so much so that local residents have declared a renewed war on the pests. **Stephen Fricker** just wrapped another season (his 11th) of mosquito surveillance on the River Murray.

The lab also picked up the first isolate of virus from mosquitoes in SA (Sindbis detected in the Riverland, with **Stephen Doggett**, ICPMR Westmead) which rounded off a successful first season of the monthly SA Mosquito Intelligence reports.

The lab recently hosted **Melanie Bannister-Tyrell**, an Honours student from ANU working on dengue predictive models with Dave Harley (National Centre for Epidemiology and Public Health) and **Craig Williams.** Craig then visited ANU to work on the project and try the coffee at the John Curtin School there. Results were favourable.

In August, Craig Williams hosted the Willunga Hill Medical Entomology Symposium, held atop that picturesque spot in the heart of southern vales wine country. Samantha Williams and PhD student **Katherine Leach** organised all the logistics. Ten early-mid career researchers from around Australia attended (**Cassie Jansen, Cameron Webb, Nigel Beebe, Andrew van den Hurk, Cheryl Johansen, Dave Harley, Leon Hugo, Tim Hurst, Peter Ryan, Petrina Johnson**), with support from senior researchers **Richard Russell** and **Scott Ritchie**, as well as Adelaide-based **Corey Bradshaw**. The meeting was a chance for people to share research aspirations and for the group to consider a 'New Roadmap' for Medical Entomology in Australia.

In September, Craig, Samantha, Katherine, Christie and Stephen all gave presentations at the Mosquito Control Association of Australia conference in Caloundra, as did **Melanie Bannister-Tyrell** from ANU.

The South Australian Museum

Archie McArthur has returned from travels overseas examining types of ants in the *Camponotus* sub genus, *Colobopsis*. He visited museums in Basel, Berlin, Bologna, Geneva, Genoa, Harvard, London, Los Angeles, Oxford, Vienna and Washington.

Chris Watts has been continuing his work on aquatic beetles. Recently he has been working on a guide to the Gyrinidae.

Mike Moore has almost completed work on unit traying our Hepialid collection and once done is all keen to work on some parts of the collection.

Preparations for the Bush-Blitz trips to Witchelina and Bon Bon Stations are in full swing. Sarah Mantle, Andy Young and several others with be collecting on behalf of the SA

Museum.

Peter Hudson, **Jan Forrest** and **Nick Birks** are participating in a standard Museum survey of the Maralinga area during Oct/Nov. Since there have been no previous comprehensive surveys done in this area before we're hoping to find lots of interesting things.

Kipling Will is scheduled to visit the collection for a few days in October.

Mark Stevens has recently returned from a field trip (or was it a holiday?) to Fiji collecting bees and collembola. He has also had a recent collecting trip to Kangaroo Island with Penny Greenslade collecting collembola.

Peter Hudson has had several brief but successful collecting trips away to secure carabids in the genus *Pogonus* for his research.

Joanne KENT

SA Councillor

NEWS FROM AFFILIATED SOCIEITES

ENTOMOLOGICAL SOCIETY OF NEW SOUTH WALES

The Society's regular meetings continue, with lively show-and-tell sessions followed by fascinating speakers. In September, Graeme Smith spoke on 'Cave insects (some experiences from Australian and PNG caves)', which included cave biology, drawing examples from his long experience of caving in Australia and PNG, while long-time absentee Andrew Beattie was with us in July, describing his far-reaching work on Citrus and Huanglongbing, a devastating psyllid-borne bacterial disease of citrus. And before that, we had the pleasure of a visit from Warrick Angus, insect photographer extraordinaire, (among many other talents). Warrick was responsible for filming the Dawson's Burrowing Bee sequences which you may have seen on David Attenborough's series "Life". You can see accounts of these talks on the Society's website http://entsocnsw.org.au/ - just click on Tarsus on the left hand side of the homepage and then when the list of issues comes up, click on the date to get a pdf of the issue.

This year's volume of General and Applied Entomology hit the streets as planned in mid-year, under new editor Robin Gunning. And finally, the Society set up its stall in August as it does each year at the annual Kuring-gai Wildflower Festival, and got lots of enthusiastic interaction from the public. Of course the Society always welcome new members, whether in Sydney or elsewhere. See our website for contact details.

Dinah HALES

Dinah Hales dfhales@hotmail.com

THE POSTGRAD PATCH

First and foremost, I must thank the AES Executive for their generosity in supporting the student dinner at the recent conference. Grub and grog (on the house of course) are two of a student's favourite things! In response, we had 23 come to dinner, which was an excellent turnout. Some may not technically have been 'students', but I suspect the lure of free food and stimulating conversation was too great. The entomological-based trivia competition was hotly contested, with questions (which were submitted in advance by the attendees) ranging from 'What plecopterans are colloquially known as 'fluffy-bums'?', submitted by **Julia Mynott**, to 'True or false? Trapdoor spiders can live for over 30 years' submitted by **Peter Langlands**.

There could only be one winner, and it was one of our Kiwi compatriots, **Alwin Sky** (above). Alwin was very happy with his prize; a pair of beautiful glass tumblers, which have the Society emblem engraved on the bottom.

Meron Zalucki (above) and **David Yeates** were an invaluable part of the crowd, with David spending way longer than his allocated 10 minutes passionately extolling the virtues of Society membership.

Hopefully this translated into some new members! I received some fantastic feedback last week, which reads *'I was very impressed with the entomological society's friendly hospitality and openness to student involvement. I certainly agree with you and with one or two other delegates who commented on how the society does a very good job of making you feel "at home", academically and socially.'* This in part comes from the accessibility of 'big-wigs' to those of us just starting out, and their willingness to chat about our research. I think this interaction is a big part of what drives a society like ours and is key to attracting students. Hopefully next year, the conference events will be as successful, and maybe even bigger! A full-day student workshop is on the cards, as well as dinner. Proposed 2011 conference symposia so far include land use change, systematic, biogeography and evolution, biocontrol and IPM, biosecurity and conservation. See you all at Lincoln University, Christchurch for AES 2011!
Kylie Anderson

BOOK REVIEW

Spider Silk: Evolution and 400 Million Years of Spinning, Waiting, Snagging, and Mating

By Leslie Brunetta and Catherine L. Craig

CSIRO Publishing June 2010 AU$39.95
ISBN: 9780643098473 hb

Spider Silk is a particularly useful tool for exploring evolution, as it is entangled with spiders' efforts to survive and reproduce – from capturing prey to avoiding predators, building shelter and protecting eggs. Leslie Brunetta (a writer and editor) and Catherine Craig (an arachnologist) have joined forces to put a new spin on the content of Craig's *Spiderwebs and* Silk (OUP 2003), perhaps for a broader audience. Spider Silk is primarily about evolution, with extensive explanations of evolution and genetics.

The authors persuade readers that evolution does not lead to 'perfection'. Thus, orb webs are not the 'pinnacle' of spider silk evolution and, in fact, cobwebs may have evolved more recently. They explain that 'living fossils', rather than being poorly evolved, have proven to be remarkably well adapted to conditions over large expanses of time.

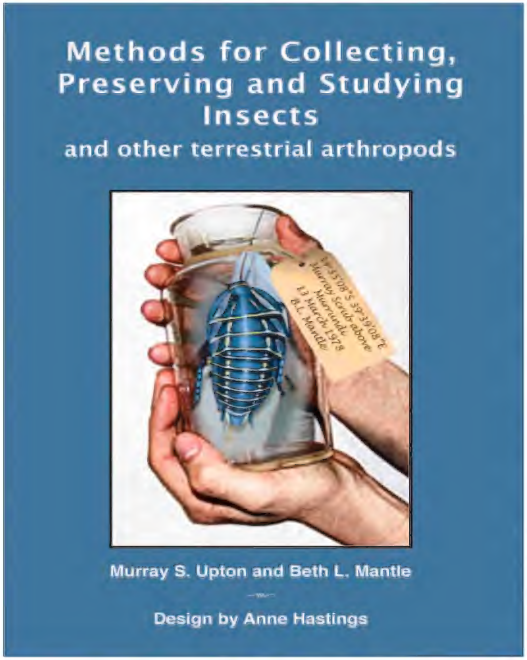
Minimal referencing (a few endnotes) makes it difficult to tell where evidence ends and conjecture begins, so this book is not likely to be very useful to academics. In addition, inaccuracies such as '*wolf spiders tend to be active during the day*' may irk arachnologists. There may be, however, something to learn for even the most knowledgeable arachnologist. (Honestly how many of you knew mygalomorph meant '*in the bodily form of a field mouse*'?)

However, these two fascinating topics – spiders and evolution – are likely to capture the interest of readers of natural history. From mythology to *Charlotte's Web*, trapdoors to treetops, ballooning to hang-gliding, or Charles Darwin to Krakatau, the story rarely gets bogged down in the scientific subject matter. (Although sections on amino acid sequences may be trying for some.) Familiar examples of spectacular spiders scatter across the pages, such as water spiders, bolus, ogre-faced and golden orb weavers. There are also some lesser-known examples, like the Namibian wheel spiders, triangle web spinners and lampshade web spiders. Although I never felt the book quite kicked into flowing narrative, it is very entertainingly written, with classic descriptions such as the spinnerets of a fossil looking '*like two hairy exhaust pipes*.'

Spider Silk encourages readers to observe and marvel at the multitude of ways in which spiders use silk, beyond the familiar orb web, helping to give these extraordinary creatures the respect they deserve.

Anna Ree CUTLER

NEW PUBLICATIONS


Methods for Collecting, Preserving and Studying Insects
and other terrestrial arthropods
Murray S. Upton and Beth L. Mantle
Design by Anne Hastings

"This book is the first and best-selling publication of the Australian Entomological Society, and has been in constant demand during its long life. Many things have changed in the world of science and entomology since the 1991 edition and, in this 2010 edition, author Murray Upton has recruited the co-authorship of Beth Mantle, the Collection Manager of the Australian National Insect Collection, to bring the book into the 21st Century. The authors have struck a balance between providing accurate, accessible and practical information, without being overly technical. This book is an indispensable and contemporary reference for all those who need to collect and preserve terrestrial arthropods for scientific study."
- David Yeates, AES Vice President

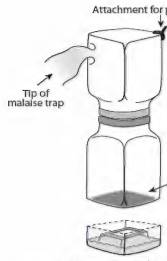


Figure 20. Malaise collecting container for microlepidoptera.

square pyramidal roof with the killing bottle at the peak and intercept barriers from corner to corner (Fig. 21).

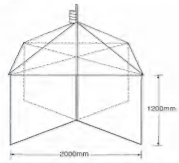


Figure 21. Omni-directional malaise trap.

Although Malaise traps are usually used on the ground, they have been used successfully when suspended over waterways and high in forest canopies.

Window traps

Window traps catch insects that drop upon hitting a barrier, and are especially useful for the collection of beetles and other heavy bodied insects. They consist of a "window" of glass, clear plastic or fine black mesh, below which there is a trough containing collecting liquid into which the insects fall. The "window" should be between 1 and 2 m long and 1 to 1.5 m high and kept taut between two poles. The trough below can be made of storm water pipe, sealed by caps at both ends and then cut in half longitudinally. It is essential that the bottom of the "window" be held taut (with wire if necessary) along the centre line of the trough. The trough may be sunk into the ground, so that it acts as a pitfall, which will improve the efficiency of the trap. A roof of black plastic will exclude rain and reduce the chance of "overflight" by insects (Figs 22, 23).

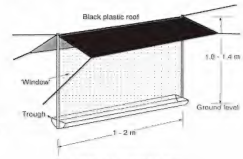


Figure 22. Window trap.

A small aquarium net, fly swat or kitchen strainer can be used to remove the specimens from the trough. Specimen should be removed at least once a week, but can be left for periods of up to 4 weeks, if necessary.

Window traps need not only be used at ground level. Provided the trough is firmly fixed below the central "window", they can be suspended wherever is required.

Baffle traps

The **baffle trap** has four vanes, or baffles, of clear plastic or glass mounted at right angles over an opaque funnel. These traps catch upwardly flying insects by mounting a translucent plastic funnel above the baffles, leading to a collecting container (see Box 2) (Fig. 24).

Tent trap

A **tent trap** is approximately 2 m^2 and 1.5 m high, and held up by four corner posts. It has only three

Figure 23. Window trap in the field.

Box 2 - Collecting Liquid

The collecting liquid recommended for use in flight intercept traps trough consists of: 78% water, 20% propylene glycol, 1% propylene phenoxytol (may be omitted) and 1% glacial acetic acid, to which is added a very small amount of detergent to break the surface tension.

In other traps, the recommended collecting liquid consists of a 50/50 solution of water and 70% ethanol. Ethylene glycol (antifreeze) can also be used. As a general rule, 80% ethanol should be used as a preservative for insects collected in these liquids.

sides and a flat roof. It can be made of cheesecloth, or the two opposing sides and roof can be made of black plastic and the back of clear plastic. The trap should be erected in a suitable flyway with the clear plastic back towards the sun or lighter area. Insects caught in this trap can be hand collected from the cheesecloth or clear plastic at regular intervals.

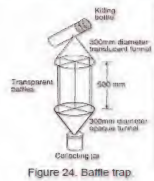


Figure 24. Baffle trap.

Suction trap

A very different form of intercept trap is the **suction trap**, where insects flying across the face of the trap are "intercepted" by suction and drawn down into the trap. The original suction trap consisted of a horizontally mounted 240 volt, 230 mm exhaust fan mounted above a long gauze cone tapering to a 40 mm diameter collecting cylinder impregnated with pyrethrum. While commercial traps of this kind are available, a variety of smaller traps, using the same principle, have been designed using battery power and often incorporate lights as an attractant (see Light traps and sheets, Page 18).

Terrestrial Arthropod Reviews

Review articles are very useful in bringing together research in particular areas which can otherwise be difficult to locate or access by non-experts. However, there are few outlets for such articles on arthropod biology. The new(ish) journal Terrestrial Arthropod Reviews aims to address this by publishing concise review articles on insects, spiders and their terrestrial relatives. The journal welcomes integrative reports on findings within a certain habitat or organism, and this includes systematics and revisionary works. Reports on species-species or species-environment interactions as well as those concerning biodiversity, conservation biology and the effect on habitats of ecological change are also welcome. Terrestrial Arthropod Reviews was launched by the publisher Brill in 2008, and from 2011 the journal will increase from two to three issues per year. Its first Impact Factor is planned to be announced in June 2011. Submission is entirely online via http://www.editorialmanager.com/tar, and all issues are available online at http://www.ingentaconnect.com/content/brill/tar For more information please contact Chris Palmer (christopher.palmer@nt.gov.au) or visit the journal's homepage at http:// brill.nl/tar

ENTOMOLOGY IN THE NEWS

The dengue mosquito, *Aedes aegypti*. Photo: UQ

Wolbachia to help control Dengue

The 2010 winner of the Mackerras medal, Scott O'Neil, was recently featured in the news. The story was picked up by various media including ABC news, Sky News, SBS, The Australian, International Business Times and TopNews United Kingdom. In what is part of a world-first trial, O'Neill's research team will be releasing mosquitoes infected with Wolbachia in a bid to control dengue in Far North Queensland from January 2011.

Dengue is a disease vectored by *Aedes aegypti* with no effective vaccines or treatment. Worldwide, the World Health Organisation estimates that 50 million cases occur each year, resulting in tens of thousands of deaths. The threat of dengue is further likely to increase as a result of global warming. In the 2008-09 wet season, over 1,000 cases of dengue fever were confirmed in Far North Queensland, the largest dengue epidemic in at least 50 years according to Queensland Health.

Wolbachia is an intracellular, maternally inherited bacterium that infests a high percentage of insect species (70%), and other groups including nematodes, isopods, and arachnids.

Wolbachia is not normally present in *Ae. aegypti* , and the mosquitoes had to be infected by

injecting embryos with *W. pipientis* . Wolbachia is not infectious, and is transferred from females to offspring. Wolbachia If a Wolbachia infected male mosquito mates with an uninfected female, the bacterium triggers a response resulting in embryo death. However, if both the male and female are infected with Wolbachia, the embryo develops normally. This should enable Wolbachia to establish in the local population.

In *Aedes aegypti,* Wolbachia reduces the ability of the arbovirus to establish productive infections. A second effect is shortening the average mosquito lifespan by approx. 50% in the laboratory.

As local residents in the trial area (and indeed many Australians) still tend to associate biological control with disastrous releases such as cane toad, a public relations campaign formed part of 'Eliminate Dengue' project. The team spent two years making 150 presentations to community groups and 3000 one-on-one presentations to allay the fears of locals. The program was also independently assessed by CSIRO and the Federal Department of Environment and Heritage.

If the trial is successful, the program will be implemented in Vietnam and Thailand, where dengue is more of a problem.

Sonya BROUGHTON

Watch: video of an interview with Scott O'Neill and Scott Ritchie on the ABC program 'Catalyst' go to http://www.abc.net.au/catalyst/stories/2675796.htm

Further reading: Stable Introduction of a Life-Shortening Wolbachia Infection into the Mosquito *Aedes aegypti.* Conor J. McMeniman, Roxanna V. Lane, Bodil N. Cass, Amy W.C. Fong, Manpreet Sidhu, Yu-Feng Wang, Scott L. O'Neill. Science 2 January 2009: Vol. 323. no. 5910, pp. 141 - 144.

Website: http://www.eliminatedengue.com/en/

Looking for dragonflies and mayflies: the National Atlas Project

In a bid to obtain update the known distribution of Odonata, British Scientists have enlisted the help of volunteers. The National Atlas Project was launched in April 2008, and will conclude in 2013.

Indeed, the establishment and spread of new species such as the Small Red-eyed Damselfly *Erythromma viridulum,* first found in Britain in 1999, supports this view. Red-eyed damselflies are normally found in the warmer climates of southern Europe and northwest Africa.

An invading species, the small red-eyed damselfly.

Volunteers survey and record their observations in one for more 10-km squares in Scotland, Ireland and England. Volunteers have access to Dragonflies in Focus Officers, field meetings and training events which are published in the Society's Dragonfly News. Updated progress of recording for the national atlas is also posted on the British Dragonfly Society website.

But it is not all bad news, a species of damselfly not seen for 57 years was recently sighted. The Dainty Damselflies had been declared extinct after floods wiped out the last remaining populations in East Anglia in 1953.

Sonya BROUGHTON

Website: http://www.dragonflysoc.org.uk/nationalatlas.html

COMING EVENTS: AUSTRALIA 2010

6-10 December 2010
Canberra, ACT
'Sustaining biodiversity – the next 50 years'

The 50th anniversary of the founding of the Ecological Society of Australia provides a timely platform for retrospective and prospective, considerations of ecology in Australia. A series of themes will focus on the challenges that will be faced by Australian ecosystems over the next 50 years, and the way that our science will need to adapt to meet these challenges.

COMING EVENTS: AUSTRALIA 2011

The Status of Australasian Entomology: Where the bloody hell are we?

3rd combined Australian and New Zealand Entomological Societies Conference

28th August – 1st September 2011
Lincoln University, Christchurch,
New Zealand

Proposed symposia:
Land use change
Systematics, biogeography and evolution
Biocontrol and IPM
Biosecurity
Conservation

Further information for conference participants, e.g., accommodation options, maps of the conference venue, will be updated in early 2011.
Web-site: http://ento.org.nz/conference/about-the-conference/

ACPP APPS DARWIN 2011
New Frontiers in Plant Pathology for Asia and Oceania
26-29 APRIL 2011 • DARWIN CONVENTION CENTRE • DARWIN, NT

4th ASIAN CONFERENCE ON PLANT PATHO LOGY & 18th BIENNIAL AUSTRALASIAN PLANT PATHOLOGY

26-29 April 2011
Darwin, NT, AUSTRALIA
"New Frontiers in Plant Pathology for Asia and Oceania"

Conference@conlog.com.au.
www.appc2011.org.

This inaugural joint conference brings together the Asian Association of Societies for Plant Pathology (AASPP) and the Australasian Plant Pathology Society (APPS).

Info: Conference Logistics, PO Box 6150, Kingston, ACT 2604, AUSTRALIA.
Fax: 61-2-6285-1336.

15th International Congress of Myriapodology UQ, Brisbane 17 - 22 July 2011

The 15th International Congress of Myriapodology (15ICM) will be held at the Women's College, University of Queensland, Brisbane Australia .

This will be the first time a myriapodology congress has been held in Australia, and only the second time in the Southern Hemisphere. As with earlier congresses, 15ICM will begin with a social get-together late on Sunday. There will be four days of single-session meetings beginning Monday morning, interrupted on Wednesday by a full-day tour of the large natural reserves close to Brisbane. A pre-conference tour is also being planned and 15ICM will officially end on Friday evening at the conference dinner.
Visit the web-site for more details: http://www.15icm.org

COMING EVENTS: INTERNATIONAL 2011

7th INTERNATIONAL IPM SYMPOSIUM

27-29 March 2012

Memphis, TN, USA.

"Integrated Pest Management, or IPM, is a long-standing, science-based, decision-making process that identifies and reduces risks from pests and pest management related strategies. It coordinates the use of pest biology, environmental information, and available technology to prevent unacceptable levels of pest damage by the most economical means, while posing the least possible risk to people, property, resources, and the environment. IPM provides an effective strategy for managing pests in all arenas from developed residential and public areas to wild lands. IPM serves as an umbrella to provide an effective, all encompassing, low-risk approach to protect resources and people from pests." (IPM Roadmap, May 17, 2004)

Symposium sessions will address IPM across disciplines, internationally, in the market place, urban settings, greenhouses, and more.

Info: E. Wolff, Conferences & Institutes, OCE, 901 W. University Ave., Suite 101, Univ. of Illinois, Urbana, IL 61801, USA. Fax: 1-217-333-9561. Voice: 1-217-333-2880.
Wolff1@illinois.edu.
Further information: www.ipmcenters.org/

SOCIETY FOR ECOLOGICAL RESTORATION

4th World Conference on Ecological Restoration
20th Annual Meeting of the Society
2nd Meeting of the Ibero-American and Caribbean Ecological Restoration Network

Mérida, Mexico · August 21-25, 2011

The SER2011 Conference Organizing Committee is currently developing an exciting program for our Merida conference. SER is now accepting proposals for special sessions, symposia, workshops and training courses. The deadline for submitting a proposal is December 1, 2010; however early submissions are encouraged and proposals will be considered in the order they are received.
Further information: http://www.ser2011.org/

Sixth International Workshop on Management of the Diamondback Moth and Other Crucifer Insect Pests
21-25 March 2011
Kasetsart University
Kamphaeng Saen campus
Nakhon Pathom, Thailand

The Workshop will be organized by AVRDC – The World Vegetable Center and its Regional Center for East and Southeast Asia, Thailand in association with Kasetsart University (Thailand) and Cornell University (USA).

The workshop will be held from 21-25 March 2011 at Kasetsart University, Kamphaeng Saen campus, Nakhon Pathom, Thailand. About 200 – 300 researchers worldwide are expected to participate and present.

The workshop is designed to provide a common forum for researchers to share their findings in bio-ecology of insect pests, host plant resistance, biological control, pesticides, and insect management on crucifer crops. As with previous workshops, a comprehensive proceedings will be published.

Call for papers: 1 October - 31 December 2010

Registration: 1 October 2010 - 31 January 2011

Contact:
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Taiwan
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Honours Scholarships

Are you interested in receiving an Honours scholarship?

The Cooperative Research Centre for National Plant Biosecurity is seeking up to two Honours students to conduct related studies on the development of a novel method (parasitoids) for the control of the Queensland fruit fly and the development of a control method for likely exotic incursions, which is target-specific and able to penetrate areas that chemical applications cannot. An understanding of the parasitoid's host searching behaviour in the Australian environment will enable an alternative or more precise response to future fruit fly incursions, in addition to enhanced control of Queensland fruit fly. The student will gain a broad education in fruit fly eradication and control, with broad ranging entomology skills, and expertise in the horticultural industry that will be highly employable or which could lead to postgraduate study and contribute significantly to Australia's biosecurity capacity.

The Honours student will be enrolled at either Charles Sturt or Sydney University (depending upon circumstance) and will work closely with staff at Industry and Investment NSW. A tax-free stipend of $5,000 pa and a generous operating allowance will apply.

It is essential that the student has an interest in plant pests threatening Australian plant biosecurity and a strong academic background in entomology, ecology or agricultural science with some experience of pest management research. The student must be an Australian Citizen or Permanent Resident and have achieved solid results in the final years of their degree.

Applicants are requested to submit the official CRCNPB application form (attached), a copy of their academic transcript and the names and contact details for two referees (including at least one University referee).

For further information about the project please contact Dr Olivia Reynolds (olivia.reynolds@industry.nsw.gov.au, 02 4640 6426), Professor Geoff Gurr (ggurr@csu.edu.au) or Dr Sarah Mansfield (sarah.mansfield@sydney.edu.au, 02 8627 1049).

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